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NX70/NX700 Series High-Speed Counter Modules (4CH) (NX70-HSC4 and NX-HSC4) User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Samsung Automation be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Samsung Automation cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Samsung Automation. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances which may lead to serious personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to minor personal injury, property damage, economic loss, or product malfunction. However, depending on circumstances, failure to follow the directions accompanying this symbol may also lead to serious consequences.

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Safety Instructions

Please read this manual and the related documentation thoroughly and familiarize yourself with product information, safety instructions and other directions before installing, operating, performing inspections and preventive maintenance. Make sure to follow the directions correctly to ensure normal operation of the product and your safety.

WARNING

- If this product is used in a situation that may cause personal injury and/or significant product damage, implement safe measures such as use of fault-safe equipment.
- Do not use this product under any conditions exposed to explosive gases. It may cause an explosion.

ATTENTION

- Please fasten cables with terminal bolts.
- Do not use the product under conditions that do not correct environmental standards.
- Make sure you connect grounding cables.
- Do not touch terminals when electric current is flowing.

Installation Environment

ATTENTION

Do not install your HSC unit if any of the following conditions are present:

- Ambient temperature outside the range of 0 to 55 °C (32 to 131 °F).
- Direct sunlight.
- Humidity outside the range of 30% to 85% (non-condensing).
- Chemicals that may affect electronic parts.
- Excessive or conductive dust, or salinity.
- High voltage, strong magnetic fields, or strong electromagnetic influences.
- Direct impact and excessive vibration.

ATTENTION

Precautions for Electrostatic

This unit may have excessive static in dry places. Please make sure to discharge electrostatic charges by touching a grounded metal bar before contacting the unit.

ATTENTION

Cleansing

Never use chemicals such as thinner because they melt, deform or discolor PCB boards

Compatibility Between High-Speed Counter Unit (1CH or 2CH) and High-Performance High-Speed Counter Unit (4CH)

- No compatibility of hardware and software
- Incompatible ladder program

Comparison between High-speed Counter Unit (1CH or 2CH) and High-Performance High-speed Counter Unit (4CH)

Item		High-Speed Counter Unit		High-Performance High-Speed Counter Unit
		NX700 (NX-HSC1) N700 (CPL7620A) NX70 (NX70-HSC1)	NX700 (NX-HSC2) N700 (CPL7621) NX70 (NX70-HSC2)	NX700 (NX-HSC4) NX70 (NX70-HSC4)
High-speed Counter function	Number of channels	1CH	2CH	4CH
	Max. counting speed	Max. 100KHz		Max. 200KHz
	Counting range	Signed 24-bit binary (-16,777,216 to +16,777,215)		Signed 32-bit binary (-2,147,483,648 to +2,147,483,647)
	Min. input pulse width	5 μs		2.5 μs
	Comparison output	2 points, (C=P, C>P)	4 points, (C=P, C>P) x 2	8 points, Any settings available for 8 target values
Input time constant function		N/A		4 μs, 8 μs, 16 μs, 32 μs(2 input unit setting)
Interrupt function		N/A		Max. 8 points per one unit, Interrupt program is available at following conditions. ① Coincide with target value of HSC ② External input

NOTE High-Performance counter unit (4CH) is available for following modules (models).

- NX700 CPU Module: NX-CPU750A, NX-CPU750B, NX-CPU750C, NX-CPU750D
- NX70 CPU Module: NX70-CPU750

Reference Manuals

NX70 System Manual
Included in the package box of NX70 CPU module (NX70-CPU750).

NX700 System Manual
Included in the package box of NX700 CPU module (NX-CPU750A, CPU750B, CPU750C, and CPU750D).

Programming Manual II (for N700a, N700H, N700 PLC).
Included in the package box of NX700 PLC and NX700 CPU module (NX-CPU750A, CPU750B, CPU750C, CPU750D) and NX70 CPU module (NX-70 CPU750).

WinFPST Software User Manual
Click “HELP” on the WinFPST S/W screen or contact your local distributor.

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High-Speed Counter Unit (4CH) Specifications

Performance Specifications

General Specifications

Item		Specifications
Temperature	Operating	0 °C to +55 °C (32 °F to 131 °F)
	Storage	-25 °C to +70 °C (-13 °F to 158 °F)
Humidity	Operating	30 to 85% RH (Non-condensing)
	Storage	30 to 85% RH (Non-condensing)
Withstand voltage		500V ac for 1 minute, between each pin <-> groundings of external connectors (Except F and E terminals) (F and E terminals: connector shield cables)
Insulation resistance		100 MΩ or more at 500 mega V DC between each pin <-> groundings of external connectors (Except F and E terminals) (F and E terminals: connector shield cables)
Vibration immunity		10 to 55 Hz, 1 cycle/minute: double amplitude of 0.75 mm, 10 minutes on 3 axis (X, Y, Z)
Shock immunity		Peak acceleration and duration 98 m/s^2 or more, 4 times for each X, Y, Z direction
Noise immunity		1500Vp-p with 50ns to 1 μs pulse width (generated by noise simulator)
Ambience		No corrosive gas, no excessive dust

I/O Specification

Common Specifications

Item	High-speed counter unit (NX-HSC4, NX70-HSC4)
Occupied I/O points	Input 32 points, output 32 points (32SX, 32SY)
Internal Current Consumption	500 mA or less (5V DC)
Operation Indicator	32 point LED (Lit when ON)
External connection method	Connector (One MIL standard 40P connector)
Weight	Approx. 130g

Input Specifications

Item			High-speed counter unit (NX-HSC4, NX70-HSC4)
Input	Isolation method		Photocoupler
	Rated input voltage		24V DC
	Rated input current		Approx. 7.5 mA (at 24V DC)
	Input impedance		Approx. 3.2 KΩ
	Voltage range		20.4V DC to 26.4V DC
	Min. ON voltage/current		19.2V DC/6 mA
	Max. OFF voltage/current		5.0V DC/1.5 mA
	Response time *1	OFF →ON	1 μs or less
		ON →OFF	2 μs or less
	Input time constant setting		N/A, 4 μs, 8 μs, 16 μs, 32 μs (2 input unit setting)
	Common method		16 points/Common (+Common)
Counter	Number of counter channels		4 CH
	Counting range		32-bit signed (-2,147,483,648 to +2,147,483,647)
	Max. counting speed *1		200 kHz
	Input mode		3 modes (Direction control, individual input, phase input)
	Min. input pulse width *1		2.5 μs
	Others		Comparison output 8 points, multiplication (1, 2, 4)
Interrupt	Interrupt points *2		N/A, 1 point/unit, 8 points/unit (Configured by mode setting switch)
	Interrupt delay		160 μs or less (NX-CPU750A, CPU750B, NX70-CPU750) 50 μs or less (NX-CPU750C, CPU750D)

*1. This value applies when the input time constant (filter) function is disabled.

*2. When using interrupts with a 1 point/unit setting, either an interrupt program from the external input terminal (NX700: B1(X8), NX70: **[** I **]** B1(X8)) or an interrupt program (one of INT16 to INT23) from comparison 0 is booted.

Output Specification

Item			High-speed counter unit (NX-HSC4, NX70-HSC4)
Output	Isolation method		Photocoupler
	Rated load voltage		5V to 24V DC
	Rated load voltage range		4.75V DC to 26.4V DC
	Max. load current		NX700: 0.1A (A11 to A18, B11 to B14 terminals), 0.8A (B15 to B18 terminals) NX70: 0.1A (**[** II **]** A1 to A8, **[** II **]** B1 to B4 terminal), 0.8A (**[** II **]** B5 to B8 terminal)
	OFF state leakage current		1 μA or less
	Max. ON state voltage drop		0.5V or less
	Response time *1	OFF →ON	1 μs or less
		ON →OFF	1 μs or less
	Surge absorber		Zener diode
	Common method		16 points/COMMON
	External power supply	Voltage	20.4V DC to 26.4V DC
		Current	90 mA (for 24V DC)
Counter	Comparison output		NX700: 8 points (A11 to A18 terminals) NX70: 8 points (**[** II **]** A1 to A8 terminal)

Function Specification

Functions	Item	High-speed counter unit (NX-HSC4, NX70-HSC4)
Input, Output	Occupied I/O points	32 In/32 Out
	External point	16 In/16 Out
Counter	Number of channels	4CH
	Counting range	32-bit signed (-2,147,483,648 to +2,147,483,647)
	Counting speed	200 kHz *1
	Input mode	Direction control input, individual input, phase differential input
	Special functions	Multiplication (1, 2, 4)
Comparison output	Point	Max. 8 points
Input time constant	Point	16 points (2-point unit)
	Constant	4, 8, 16, 32 μs

*1. This value applies when the input time constant (filter) function is disabled.

I/O Contact Points

NX700 High-Speed Counter Unit (NX-HSC4)

Input Contacts

NX700 High-Speed Counter Unit (NX-HSC4)

	External Terminal	Functions					
		Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A1	X0	-	CH0 IN-A	-	-	-
	A2	X1	-	CH0 IN-B	-	-	-
	A3	X2	-	CH0 Clear	-	-	-
	A4	X3	-	CH0 Mask	-	-	-
	A5	X4	-	CH1 IN-A	-	-	-
	A6	X5	-	CH1 IN-B	-	-	-
	A7	X6	-	CH1 Clear	-	-	-
	A8	X7	-	CH1 Mask	-	-	-
	B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
	B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
	B3	XA	Interrupt INT2	CH2 Clear	-	-	-
	B4	XB	Interrupt INT3	CH2 Mask	-	-	-
	B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
	B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
	B7	XE	Interrupt INT6	CH3 Clear	-	-	-
	B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O	-	X10	-	-	Comparison CMP0	-	-
	-	X11	-	-	Comparison CMP1	-	-
	-	X12	-	-	Comparison CMP2	-	-
	-	X13	-	-	Comparison CMP3	-	-
	-	X14	-	-	Comparison CMP4	-	-
	-	X15	-	-	Comparison CMP5	-	-
	-	X16	-	-	Comparison CMP6	-	-
	-	X17	-	-	Comparison CMP7	-	-
	-	X18	-	-	-	-	-
	-	X19	-	-	-	-	-
	-	X1A	-	-	-	-	-
	-	X1B	-	-	-	-	-
	-	X1C	-	-	-	-	-
	-	X1D	-	-	-	-	-
	-	X1E	-	-	-	-	-
	-	X1F	-	-	-	-	-

- : No input allocation.

The I/O number allocations above are applied when NX700 PLC High-speed counter unit(4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Output Contacts

	External Terminal	Functions					
		Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A11	Y20	-	-	[Comparison CMP0]	-	-
	A12	Y21	-	-	[Comparison CMP1]	-	-
	A13	Y22	-	-	[Comparison CMP2]	-	-
	A14	Y23	-	-	[Comparison CMP3]	-	-
	A15	Y24	-	-	[Comparison CMP4]	-	-
	A16	Y25	-	-	[Comparison CMP5]	-	-
	A17	Y26	-	-	[Comparison CMP6]	-	-
	A18	Y27	-	-	[Comparison CMP7]	-	-
	B11	Y28	-	-	-	-	-
	B12	Y29	-	-	-	-	-
	B13	Y2A	-	-	-	-	-
	B14	Y2B	-	-	-	-	-
	B15	Y2C	-	-	-	-	-
	B16	Y2D	-	-	-	-	-
	B17	Y2E	-	-	-	-	-
	B18	Y2F	-	-	-	-	-
Unit Internal I/O	-	Y30	-	CH0 Soft Clear	-	-	-
	-	Y31	-	CH0 Soft Mask	-	-	-
	-	Y32	-	CH1 Soft Clear	-	-	-
	-	Y33	-	CH1 Soft Mask	-	-	-
	-	Y34	-	CH2 Soft Clear	-	-	-
	-	Y35	-	CH2 Soft Mask	-	-	-
	-	Y36	-	CH3 Soft Clear	-	-	-
	-	Y37	-	CH3 Soft Mask	-	-	-
	-	Y38	-	-	-	-	-
	-	Y39	-	-	-	-	-
	-	Y3A	-	-	-	-	-
	-	Y3B	-	-	-	-	-
	-	Y3C	-	-	-	-	-
	-	Y3D	-	-	-	-	-
	-	Y3E	-	-	-	-	-
	-	Y3F	-	-	-	-	-

- : No output allocation

[ ] : Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX700 PLC High-speed counter unit is installed in slot 0.
I/O number can differ depending on the installation slot.

NX70 High-Speed Counter Unit (NX70-HSC4)

Input Contacts

	External Terminal		Functions					
			Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[I]	A1	X0	-	CH0 IN-A	-	-	-
		A2	X1	-	CH0 IN-B	-	-	-
		A3	X2	-	CH0 Clear	-	-	-
		A4	X3	-	CH0 Mask	-	-	-
		A5	X4	-	CH1 IN-A	-	-	-
		A6	X5	-	CH1 IN-B	-	-	-
		A7	X6	-	CH1 Clear	-	-	-
		A8	X7	-	CH1 Mask	-	-	-
		B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
		B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
		B3	XA	Interrupt INT2	CH2 Clear	-	-	-
		B4	XB	Interrupt INT3	CH2 Mask	-	-	-
		B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
		B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
		B7	XE	Interrupt INT6	CH3 Clear	-	-	-
		B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O		-	X10	-	-	Comparison CMP0	-	-
		-	X11	-	-	Comparison CMP1	-	-
		-	X12	-	-	Comparison CMP2	-	-
		-	X13	-	-	Comparison CMP3	-	-
		-	X14	-	-	Comparison CMP4	-	-
		-	X15	-	-	Comparison CMP5	-	-
		-	X16	-	-	Comparison CMP6	-	-
		-	X17	-	-	Comparison CMP7	-	-
		-	X18	-	-	-	-	-
		-	X19	-	-	-	-	-
		-	X1A	-	-	-	-	-
		-	X1B	-	-	-	-	-
		-	X1C	-	-	-	-	-
		-	X1D	-	-	-	-	-
		-	X1E	-	-	-	-	-
		-	X1F	-	-	-	-	-

- : No input allocation.

The I/O number allocations above are applied when NX70 PLC High-speed counter unit(4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Output Contacts

	External Terminal		Functions					
			Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[II]	A1	Y20	-	-	[Comparison CMP0]	-	-
		A2	Y21	-	-	[Comparison CMP1]	-	-
		A3	Y22	-	-	[Comparison CMP2]	-	-
		A4	Y23	-	-	[Comparison CMP3]	-	-
		A5	Y24	-	-	[Comparison CMP4]	-	-
		A6	Y25	-	-	[Comparison CMP5]	-	-
		A7	Y26	-	-	[Comparison CMP6]	-	-
		A8	Y27	-	-	[Comparison CMP7]	-	-
		B1	Y28	-	-	-	-	-
		B2	Y29	-	-	-	-	-
		B3	Y2A	-	-	-	-	-
		B4	Y2B	-	-	-	-	-
		B5	Y2C	-	-	-	-	-
		B6	Y2D	-	-	-	-	-
		B7	Y2E	-	-	-	-	-
		B8	Y2F	-	-	-	-	-
Unit Internal I/O		-	Y30	-	CH0 Soft Clear	-	-	-
		-	Y31	-	CH0 Soft Mask	-	-	-
		-	Y32	-	CH1 Soft Clear	-	-	-
		-	Y33	-	CH1 Soft Mask	-	-	-
		-	Y34	-	CH2 Soft Clear	-	-	-
		-	Y35	-	CH2 Soft Mask	-	-	-
		-	Y36	-	CH3 Soft Clear	-	-	-
		-	Y37	-	CH3 Soft Mask	-	-	-
		-	Y38	-	-	-	-	-
		-	Y39	-	-	-	-	-
		-	Y3A	-	-	-	-	-
		-	Y3B	-	-	-	-	-
		-	Y3C	-	-	-	-	-
		-	Y3D	-	-	-	-	-
		-	Y3E	-	-	-	-	-
		-	Y3F	-	-	-	-	-

- : No output allocation

[ ] : Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX70 PLC High-speed counter unit is installed in slot 0. I/O number can differ depending on the installation slot.

Shared Memory Areas

NX700, NX70 PLC High-speed counter unit (4CH) shared memory map.

Shared Memory Map

Address	Access unit [word]	Functions	R/W	Event
100h, 101h	2W	Counter setting	R/W	Counter functions setting
102h, 103h	2W	Reserved		
104h, 105h	2W	Comparison output setting		Comparison output setting
106h, 107h	2W	Reserved		
108h, 109h	2W	Counter <CH0> Current value	R/W	CH0 Counter Current value (signed 32-bit)
10Ah, 10Bh	2W	Counter <CH1> Current value	R/W	CH1 Counter Current value (signed 32-bit)
10Ch, 10Dh	2W	Counter <CH2> Current value	R/W	CH2 Counter Current value (signed 32-bit)
10Eh, 10Fh	2W	Counter <CH3> Current value	R/W	CH3 Counter Current value (signed 32-bit)
110h to 11Fh	2W	Reserved		
120h, 121h	2W	Comparison output Set value MEM0	R/W	Comparison with counter current value (signed 32-bit)
122h, 123h	2W	Comparison output Set value MEM1	R/W	Comparison with counter current value (signed 32-bit)
124h, 125h	2W	Comparison output Set value MEM2	R/W	Comparison with counter current value (signed 32-bit)
126h, 127h	2W	Comparison output Set value MEM3	R/W	Comparison with counter current value (signed 32-bit)
128h, 129h	2W	Comparison output Set value MEM4	R/W	Comparison with counter current value (signed 32-bit)
12Ah, 12Bh	2W	Comparison output Set value MEM5	R/W	Comparison with counter current value (signed 32-bit)
12Ch, 12Dh	2W	Comparison output Set value MEM6	R/W	Comparison with counter current value (signed 32-bit)
12Eh, 12Fh	2W	Comparison output Set value MEM7	R/W	Comparison with counter current value (signed 32-bit)
130h to 137h	2W	Reserved		
138h, 139h	2W	Interrupt Setting	R/W	Interrupt Input Point Setting
13Ah, 13Bh	2W	Reserved		
13Ch, 13Dh	2W	Input time constant setting	R/W	Input time constant setting for input X0 to XF
13Eh, 13Fh	2W	Reserved		
140h to 15Fh	2W	Reserved		

NOTE R/W: Read and write. R: Read only.

Shared Memory Area Description

Below is a description of NX700, NX70 PLC high-speed counter (4CH) unit shared memory.

100h, 101h	Counter functions setting

Address: 100h 101h

Setting of each counter CH operation mode with shared memory settings. Please configure the counter function modes according to the table on the right.

b31~ b28	b27~ b24	b23~ b20	b19~ b16	b15~ b12	b11~ b8	b7~ b4	b3~ b0

Counter setting

- b3~b0 → Counter CH0 setting (used/unused)
- b7~b4 → Counter CH0 setting (input mode)
- b11~b8 → Counter CH1 setting (used/unused)
- b15~b12 → Counter CH1 setting (input mode)
- b19~b16 → Counter CH2 setting (used/unused)
- b23~b20 → Counter CH2 setting (input mode)
- b27~b24 → Counter CH3 setting (used/unused)
- b31~b28 → Counter CH3 setting (input mode)

Setting (Input Mode).. Effective only for terminal input

Set value (HEX)	Functions	
	Terminal input mode	Multiplication
0	Direction control *2	N/A
1	Individual input	
2	Phase input	1 multiplication
3		2 multiplications
4		4 multiplications
5	Invalid *1	
6		
7		
8		
9		
A		
B		
C		
D		
E		
F		

Setting (Function)

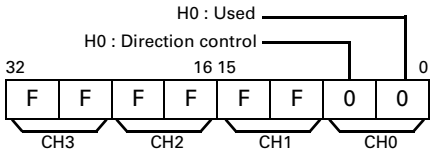
Set value (HEX)	Functions
	Counter
0	Used (Terminal input)
1	
2	Invalid *1
3	
4	
5	
6	
7	
8	
9	
A	
B	
C	
D	
E	
F	Unused *2

*1: Do not use this setting.

*2: Initial values on power input are set as direction control for input mode and unused for function setting.

Shared Memory Area Setting Example

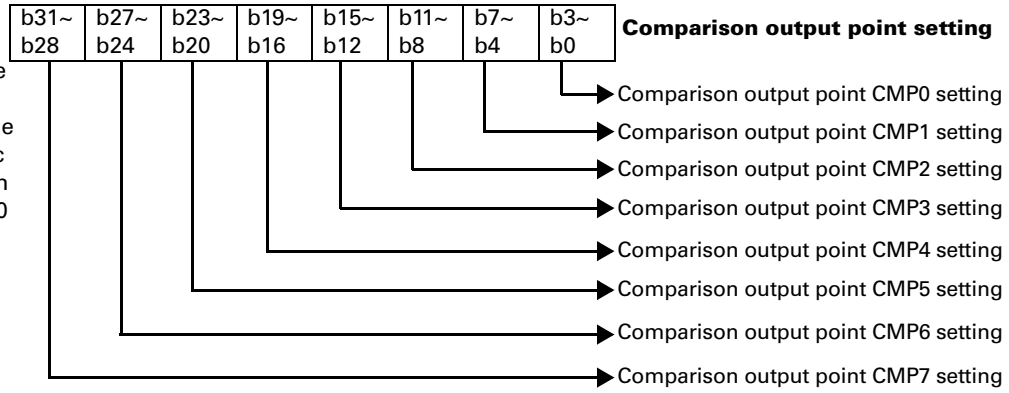
Setting item	Shared memory address	Setting example	Setting range
Counter	100h to 101h	For each channel (CH0 to CH3), 8 bits are allocated.	Setting range for each channel H00 : Direction control H10 : Individual input H20 : Phase input (1 multiplication) H30 : Phase input (2 multiplications) H40 : Phase input (4 multiplications) HFF : Unused



102h, 103h	Reserved
104h, 105h	Comparison output setting

Address: 104h, 105h

Select the counter channel whose current value will be compared with the comparison set value and the output logic for each comparison output points, CMP0 to CMP7.



Comparison Output Setting

Set value (HEX)	Comparison output functions	Functions	
		Output logic	Counter CH to be compared
0	Used	ON when current value < set value	CH0
1			CH1
2			CH2
3			CH3
4		ON when current value ≥ set value	CH0
5			CH1
6			CH2
7			CH3
8	Invalid *1	Invalid *1	
9			
A			
B			
C			
D			
E			
F	Unused *2	-	

*1: Do not use this setting.

*2: Initial value on power input is set to Unused.

Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Comparison output setting	104h to 105h	For comparison output 8 points (CMP0 to CMP7), 4 bits are allocated for each. H0: Negative logic output counter CH0 32 16 15 0 F F F F F F F 0 CMP7 CMP6 CMP5 CMP4 CMP3 CMP2 CMP1 CMP0	Setting range for each channel ON when current value < set value 1) H0 : CH0 2) H1 : CH1 3) H2 : CH2 4) H3 : CH3 ON when current value ≥ set value 1) H4 : CH0 2) H5 : CH1 3) H6 : CH2 4) H7 : CH3 5) HF : Unused

106h, 107h	Reserved

108h to 10Fh	Counter <CHx> Current value

- Current value of each counter is stored in shared memory as described below.
- Use F150 and P150 instructions (reading data from high-performance units) to read the current value by 2 word unit.

Counter CH0 Current value	Address: 108h 109h	K-2,147,483,648 to K+2,147,483,647
Counter CH1 Current value	Address: 10Ah 10Bh	K-2,147,483,648 to K+2,147,483,647
Counter CH2 Current value	Address: 10Ch 10Dh	K-2,147,483,648 to K+2,147,483,647
Counter CH3 Current value	Address: 10Eh 10Fh	K-2,147,483,648 to K+2,147,483,647

110h to 11Fh	Reserved

120h to 12Fh	Comparison output set value

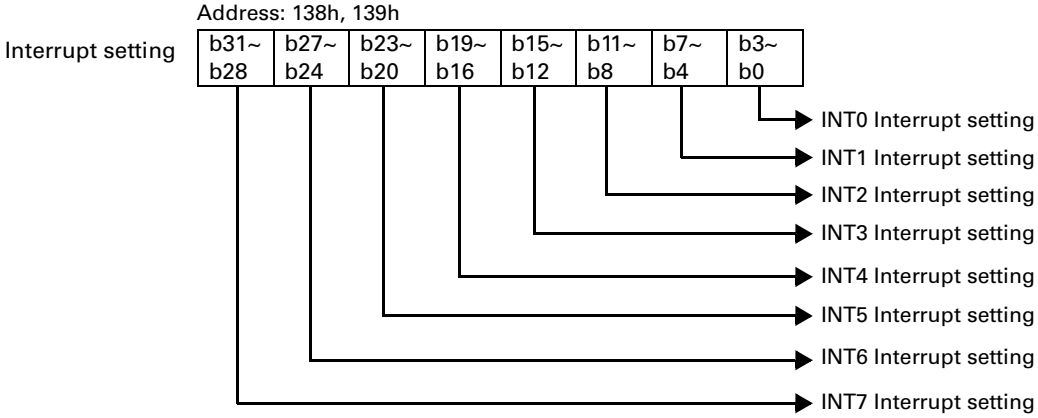
- Set the comparison output set value to be compared with counter current value.

Comparison output Set value (for CMP0)	MEM0	Address: 120h 121h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP1)	MEM1	Address: 122h 123h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP2)	MEM2	Address: 124h 125h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP3)	MEM3	Address: 126h 127h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP4)	MEM4	Address: 128h 129h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP5)	MEM5	Address: 12Ah 12Bh	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP6)	MEM6	Address: 12Ch 12Dh	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP7)	MEM7	Address: 12Eh 12Fh	K-2,147,483,648 to K+2,147,483,647

130h to 137h	Reserved

138h, 139h	Interrupt Setting

➡ Set interrupt function mode according to the table below.



Set value (HEX)	Functions		
	Interrupt Function	Connection point	Interrupt condition
0	Used	Comparison output function *1 (CMP0 to CMP7)	Coincidence output
1			
2		Input terminal (X8 to XF)	off →on
3			on →off *2
4	Invalid *3	Invalid *3	Invalid *3
5			
6			
7			
8			
9			
A			
B			
C			
D			
E			
F	Unused *4	-	-

*1: Each of INT0 to INT7 corresponds to each of CMP0 to CMP7.

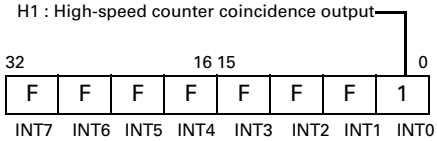
<Ex> When Set Value 1 is selected for INT0 interrupt setting, interrupt generates on coincidence output (EQ0) at CMP0.

*2: When you selected this setting, make sure you run interrupt clear after setting.

*3: Do not use this setting.

*4: Initial value on power input is set to unused.

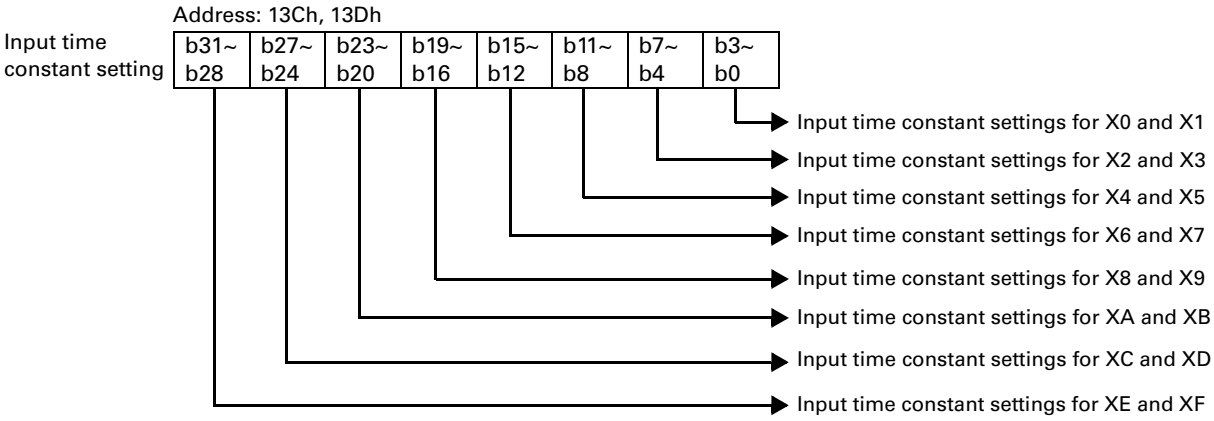
Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Interrupt	138h to 139h	For interrupt programs (INT0 to INT7), 4 bits are allocated for each program. 	Interrupt setting range H1 : High-speed counter coincidence output H2 : External input off →on H3 : External input on →off HF : Unused

13Ah, 13Bh	Reserved

13Ch, 13Dh	Input time constant setting

- Set the input time constant for 8 external input terminal groups with shared memory settings.
- Input time constant is set for external input terminal, so function allocation for each of input X0 to XF settings are also valid. (Counter input, interrupt input)


Address: 13Ch, 13Dh
Input time constant setting
b31~ b28
b27~ b24
b23~ b20
b19~ b16
b15~ b12
b11~ b8
b7~ b4
b3~ b0
Input time constant settings for X0 and X1
Input time constant settings for X2 and X3
Input time constant settings for X4 and X5
Input time constant settings for X6 and X7
Input time constant settings for X8 and X9
Input time constant settings for XA and XB
Input time constant settings for XC and XD
Input time constant settings for XE and XF

Input Time Constant Setting

Set value (HEX)	Functions	
	Input time constant	Effective pulse width
0	Used	4 μs
1		8 μs
2		16 μs
3		32 μs
4	Invalid *1	Invalid *1
5		
6		
7		
8		
9		
A		
B		
C		
D		
E		
F	Unused *2	-

*1: Do not use this setting.

*2: Initial value on power input is set to unused.

Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Input time constant	13Ch to 13Dh	For inputs (X0, X1 to XE, XF), 4 bits are allocated for each input. H2 : 16 μs 32 16 15 0 F F F F F F F 2 XF XD XB X9 X7 X5 X3 X1 XE XC XA X8 X6 X4 X2 X0	Input time constant setting range H0 : 4 μs H1 : 8 μs H2 : 16 μs H2 : 32 μs HF : Unused

13Eh, 13Fh	Reserved

140h to 15Fh	Reserved

➡ This area is reserved for pulse I/O unit shared memory, and therefore is not used by high-speed counter unit.

Address	Access unit [word]	Functions	R/W	Event
140h, 141h	2W	PLS/PWM Setting	R/W	Pulse output form setting
142h, 143h	2W	PLS/PWM Plug	R	Pulse output form monitor
144h to 147h	2W	Reserved		
148h, 149h	2W	PLS0/PWM0 frequency setting	R/W	Output frequency setting
14Ah, 14Bh	2W	PLS1/PWM1 frequency setting	R/W	Output frequency setting
14Ch, 14Dh	2W	PLS2/PWM2 frequency setting	R/W	Output frequency setting
14Eh, 14Fh	2W	PLS3/PWM3 frequency setting	R/W	Output frequency setting
150h to 157h	2W	Reserved		
158h, 159h	2W	PWM0 Duty Setting	R/W	PWM Duty Setting
15Ah, 15Bh	2W	PWM1 Duty Setting	R/W	PWM Duty Setting
15Ch, 15Dh	2W	PWM2 Duty Setting	R/W	PWM Duty Setting
15Eh, 15Fh	2W	PWM3 Duty Setting	R/W	PWM Duty Setting

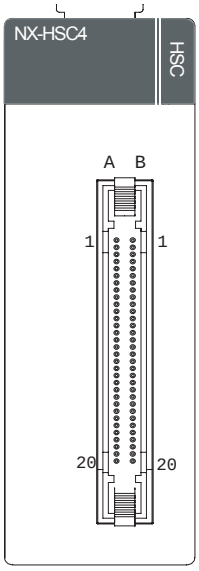
2

High-Speed Counter Unit (4CH) Functions

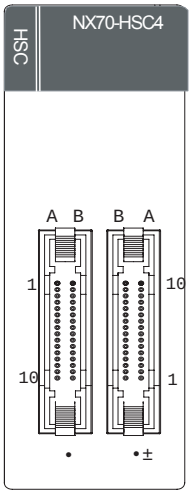
High-Speed Counter Unit (4CH) Functions

NX700, NX70 PLC high-speed counter unit is a special unit for fast counter feature, which also provides a variety of functions. Main features of high-speed counter unit include the following.

HSC provides various functions as follows:



NX700 PLC
High-Speed Counter
Unit (NX-HSC4)



NX70 PLC
High-Speed Counter
Unit(NX70-HSC4)

It operates as mixed I/O unit.	General I/O Function (See *"Chapter 4"*)
Set the effective pulse width of input signal.	Input Time Constant Function (See *"Chapter 5"*)
Count pulse number.	Counter Function (See *"Chapter 6"*)
Compare pulse number and set value and output the results.	Comparison Output Function (See *"Chapter 7"*)
Generate interrupt signal.	Interrupt Function (See *"Chapter 8"*)
Pulse output.	Pulse Output Function
PWM output.	PWM Output Function.

Pulse output and PWM output is only available to pulse I/O unit.
Be careful that this function is NOT available for advanced high-speed counter unit (4CH).

System Configuration Without Losses

Unit I/O terminals that are not allocated to any function can be used for general I/O terminal, which enables a single high-speed counter unit to be used both for counter function and sensor Input, providing system configuration without system resource loss.

Interrupt Function

Interrupt control for general external input, and support for interrupt control by counter and set value coincidence.

Four 0.8A Outputs

Functions of High-Speed Counter Unit

- Each function can be operated by shared memory settings.
  But, interrupt mode setting is selected with mode setting switch on the bottom of the unit.
- The factory default is set to OFF (no interrupt functions) for switches, and the unit runs as usual I/O unit on power input.

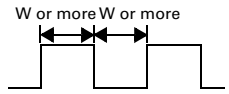
General I/O Functions

- High-speed counter unit can be used as 32In/32Out mixed I/O unit with its default setting without mode setting switch or shared memory configuration.
  But, I/O is initially allocated for 16 points for each, actually it will be used as 16In/16Out mixed I/O unit.
- I/O allocation changes depending on unit installation slot.
  (EX) When unit is installed in slot 0, occupied I/O will be WX0 to WX1, WY2 to WY3, and the actual allocation for terminal will be WX0 and WY2.
- Function I/O will set as priority when using functions, but for areas without function allocation, they will be used for general I/O.

Input Time Constant Functions

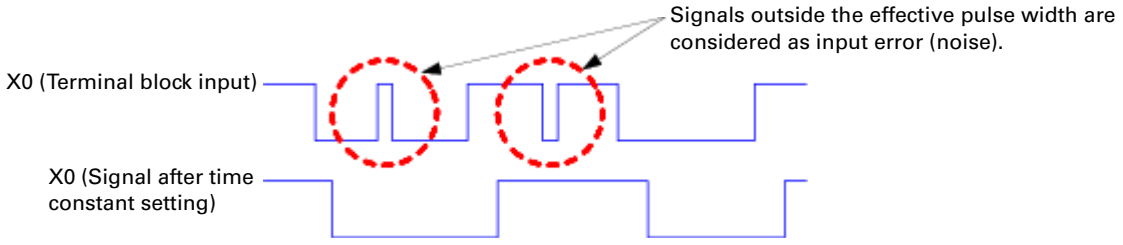
- Effective pulse width for input signals form I/O connector can be set by this function.
  Input signal whose pulse width is smaller than the effective pulse width is considered as noise.
- Effective pulse width can be set by four constants, two point unit for I/O connector, as described below.

Effective Pulse Width (Wμs)	Max. count speed
No setting	200 kHz
4	125 kHz
8	62.5 kHz
16	31.2 kHz
32	15.6 kHz



Setting Unit	External input terminal	
	NX700 High-Speed Counter Unit	NX70 High-Speed Counter Unit
Group 1	A1, A2 (Input allocation X0, X1)	[I] A1, A2 (Input allocation X0, X1)
Group 2	A3, A4 (Input allocation X2, X3)	[I] A3, A4 (Input allocation X2, X3)
Group 3	A5, A6 (Input allocation X4, X5)	[I] A5, A6 (Input allocation X4, X5)
Group 4	A7, A8 (Input allocation X6, X7)	[I] A7, A8 (Input allocation X6, X7)
Group 5	B1, B2 (Input allocation X8, X9)	[I] B1, B2 (Input allocation X8, X9)
Group 6	B3, B4 (Input allocation XA, XB)	[I] B3, B4 (Input allocation XA, XB)
Group 7	B5, B6 (Input allocation XC, XD)	[I] B5, B6 (Input allocation XC, XD)
Group 8	B7, B8 (Input allocation XE, XF)	[I] B7, B8 (Input allocation XE, XF)

- Input time constant function prevents input errors caused by noise, by setting the effective pulse width of input signals. See *"Chapter 5"* for detailed setting for input time constant.


Signals outside the effective pulse width are considered as input error (noise).
X0 (Terminal block input)
X0 (Signal after time constant setting)

ATTENTION Be careful that the default is set to no time constant setting.

Interrupt Function

➡ The mode setting switch determines the function mode described below on power input.

Mode	Unit operation	Available interrupt points	Numbers of interrupt programs that can be set by the program	Interrupt input *3
A	No interrupt function unit	0	-	-
B	Interrupt function unit	8	Corresponding to INT0 to 7 or INT8 to 15 *1	I/O connector (X8 to XF) Comparison coincidence signal (EQ0 to EQ7) *2
C	Interrupt generation Special unit	1	Corresponding to INT16 to 23 *1	I/O Connector (X8) Comparison coincidence signal (EQ0) *2

*1: Corresponding interrupt number differs depending on the unit installation location.

*2: Internal signal for comparison function. Generated when counter current value and comparison value coincide.

*3: Input signal for interrupt generation is selectable. (I/O connector or comparison coincidence signal)

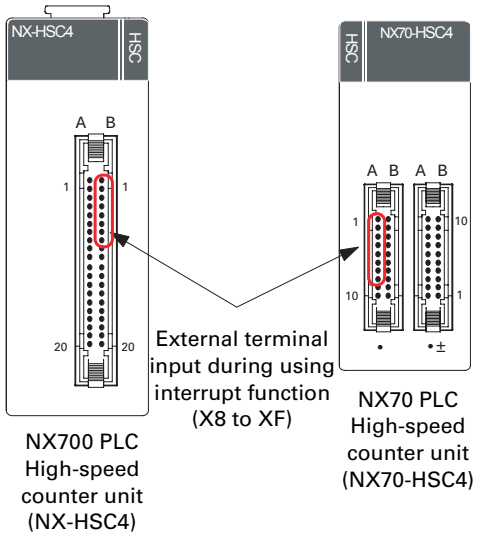
Example of ladder instruction and interrupt input signal corresponding

Mode B

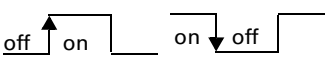
INT0 ←X8, or EQ0
INT1 ←X9, or EQ1
INT2 ←XA, or EQ2
INT3 ←XB, or EQ3
INT4 ←XC, or EQ4
INT5 ←X8, or EQ5
INT6 ←XD, or EQ6
INT7 ←XE, or EQ7

Mode C

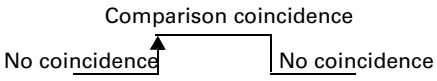
INT16 ←X8, or EQ0



Interrupt generates on edge input.



External terminal input



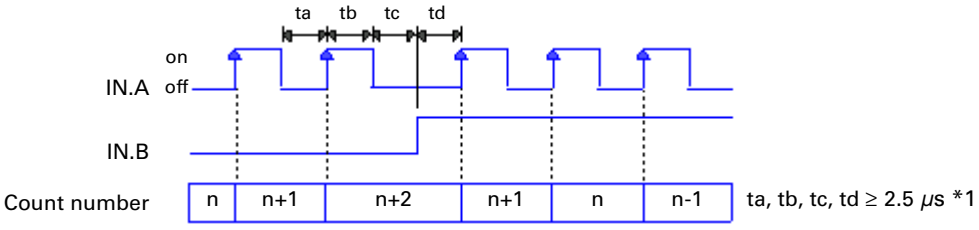
Comparison coincidence signal input

High-speed Counter Function

HSC has four high-speed counter channels. There are three input modes for counting. Input mode can be set for each CH.

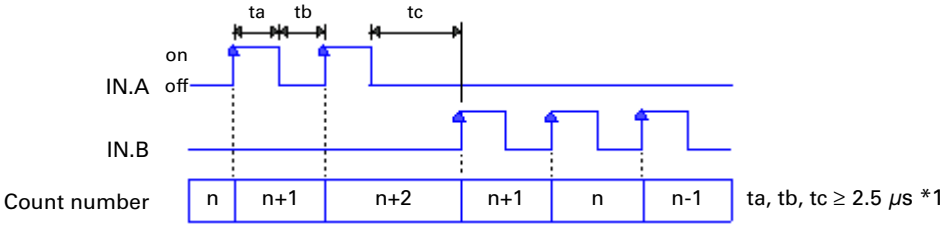
Direction control

Counter value changes with pulse string and direction signals.



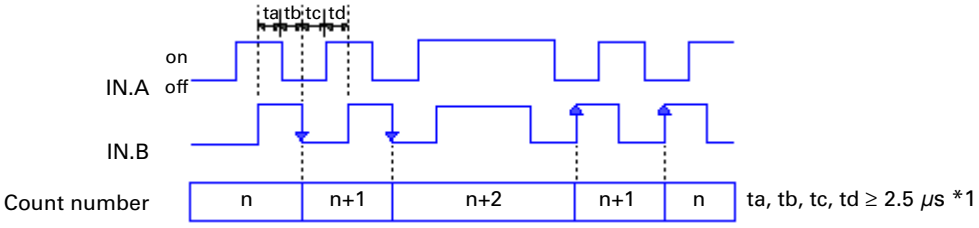
Individual input

Count value changes with each input signal at CW and CCW.



Phase differential

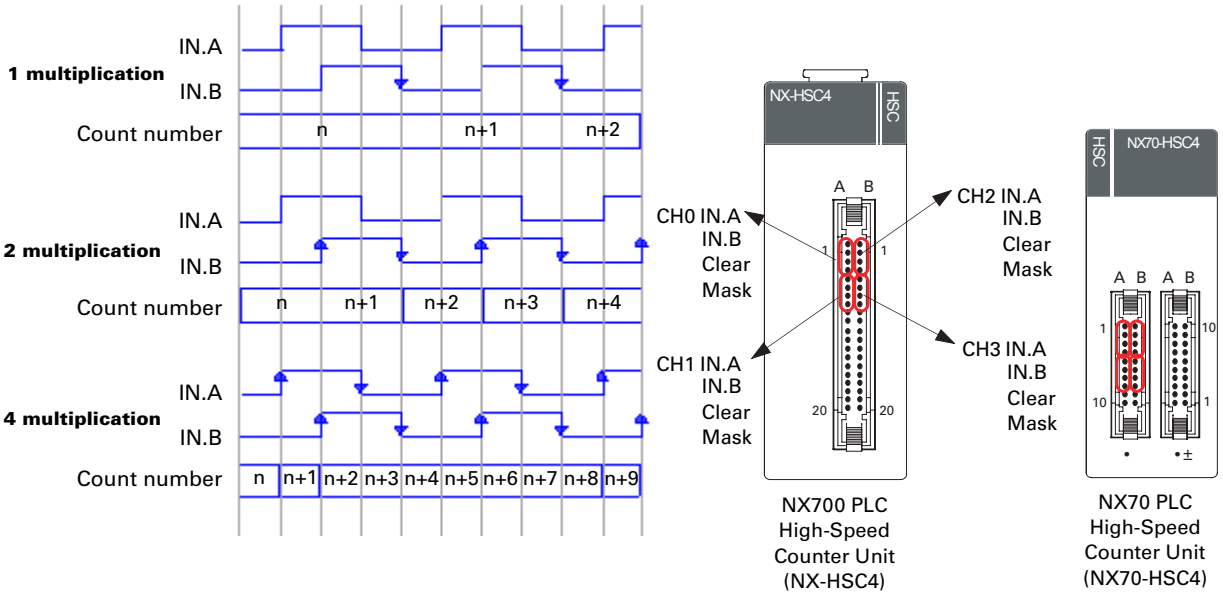
Count value changes with the phase differential input on encoder and others.



*1: Value for when input time constant (filter) is set to None.

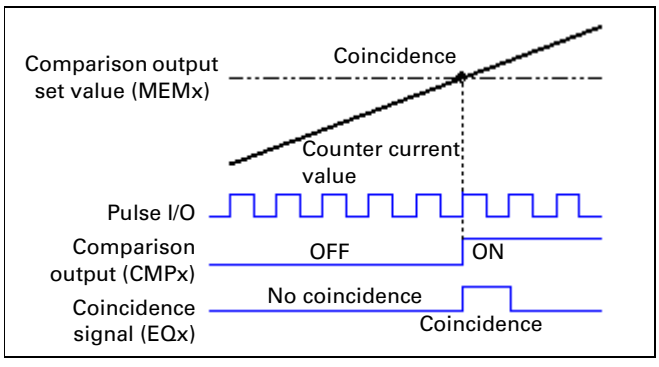
IMPORTANT About multiplication

There are three types of multiplication for phase differential input mode as following.

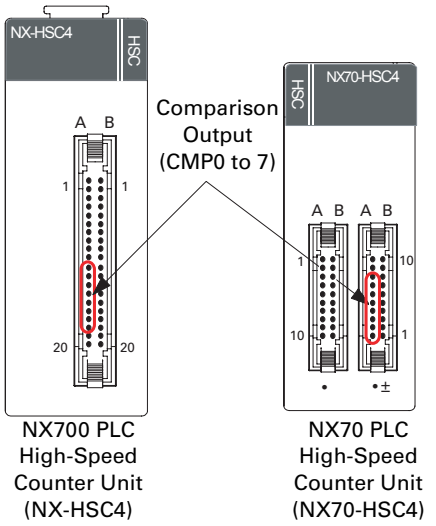


Comparison Output Function

- High-speed counter unit has 8 points of comparison output. (CMP0 to CMP7)
- Counter current value and comparison set value is compared, and the comparison results are output.
  Comparison output set value is set by shared memory. (MEM0 to MEM7)
  (Counter current value) < (Comparison output set value) → Comparison output: OFF
  (Counter current value) ≥ (Comparison output set value) → Comparison output: ON



Comparison output ON/OFF can also be set as reverse operation.
EQx is an internal processing signal that is not sent outside.



Configuration and Limit for High-Speed Counter Unit

Configuration Limit with Current Consumption

Internal current consumption for HSC unit is shown below (at 5V).
Be careful when configuring system, not to exceed the total capacity limit, considering the consumption of other units.

PLC Model	Name	Catalog number	Current consumption (5V power)	Remarks
NX700 PLC	High-Performance high-speed counter unit (4CH)	NX-HSC4	450 mA	
NX70 PLC	High-Performance high-speed counter unit (4CH)	NX70-HSC4	400 mA	

Mounting of High-Speed Counter Unit

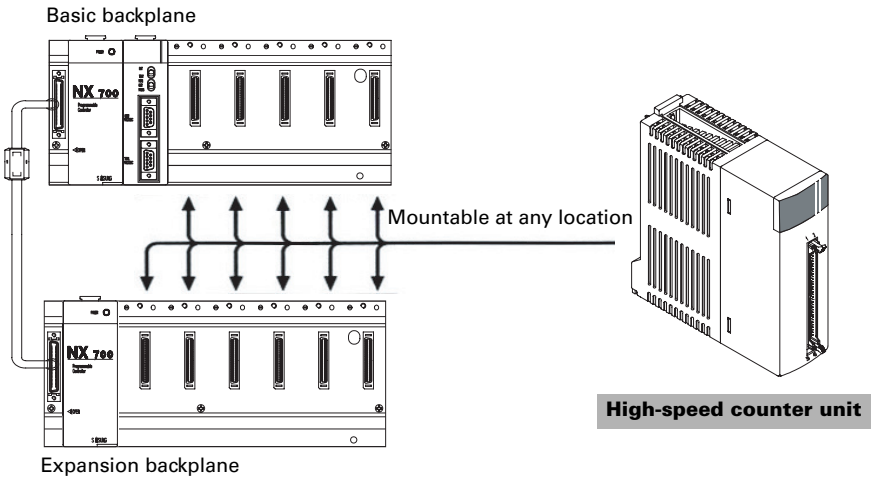
➡ **For NX700 PLC**

HSC unit can be mounted at any location on CPU backplane or expansion backplane.
But it cannot be mounted on power supply unit or CPU unit slots.
There is no limit to the number of HSC mounting for NX700 PLC.

➡ **For NX70 PLC**

HSC unit can be mounted at any location on the basic backplane.
But it cannot be mounted on power supply unit or CPU unit slots.
There is no limit to the number of HSC mounting for NX70 PLC.

(Example of NX700 PLC)



NOTE **HSC unit can be used for only the following CPU modules (models).**

NX700 CPU Module: NX-CPU750A, NX-CPU750B, NX-CPU750C, NX-CPU750D
NX70 CPU Module: NX70-CPU750

Interrupt Points

When used as interrupt unit, maximum 2 units can provide eight points each. Other units can use only one point (C mode) for interrupt.

➡ Interrupt Functions Available and Interrupt Generation Special Unit

Interrupt Function Available

HSC unit set to mode B is used as interrupt unit and provides 8 interrupts per each unit.

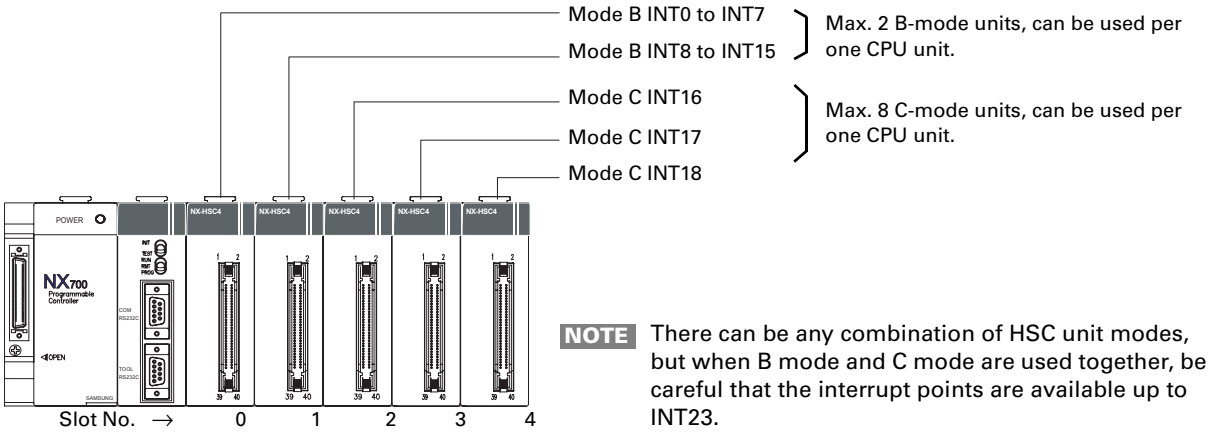
Be careful that only two mode B units can be used for one CPU unit.

Interrupt Generation Special Unit

HSC unit set to mode C is used as interrupt generation special unit, and provides one interrupt per one unit.

Be careful that only 8 interrupt generation special units can be used per one CPU unit.

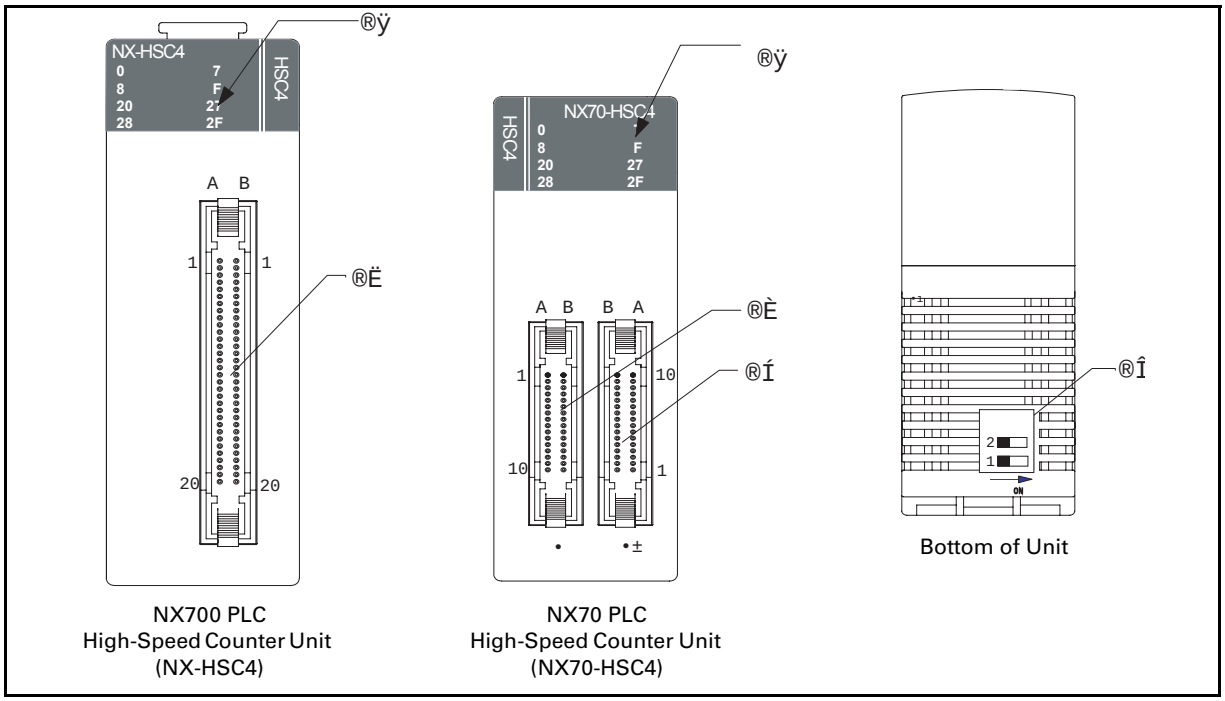
➡ Interrupt function with multiple high-speed counter units


Mode B INT0 to INT7
Mode B INT8 to INT15
Max. 2 B-mode units, can be used per one CPU unit.
Mode C INT16
Mode C INT17
Mode C INT18
Max. 8 C-mode units, can be used per one CPU unit.
POWER
NX-HSC4
NX700
Programmable Controller
OPEN
Slot No. → 0 1 2 3 4

NOTE There can be any combination of HSC unit modes, but when B mode and C mode are used together, be careful that the interrupt points are available up to INT23.

Parts and Functions

Parts and Functions



NX700 PLC
High-Speed Counter Unit
(NX-HSC4)

NX70 PLC
High-Speed Counter Unit
(NX70-HSC4)

Parts and Functions

① **Status LED**
Turns on showing the I/O status at the terminal blocks.
See *"Status LED" on page 32* for details.

② **I/O Connector (NX700 PLC)**
Relays output signals to high-speed counter unit.
See *"Terminal Diagram" on page 34* for details.

③ **Input Connector (NX70 PLC), [I]**
Relays input signals from an external device to the high-speed counter unit. See *"Terminal Diagram" on page 34*.

④ **Output Connector (NX70 PLC), [II]**
Relays output signals from the high-speed counter unit to an external device. See *"Terminal Diagram" on page 34*.

⑤ **Mode Setting Switch**
Set the interrupt mode of the unit. Available modes are as follows:
- No Interrupt Function
- Interrupt Function (8 Interrupt Points)
- Interrupt Generation Special Unit (1 Interrupt Point)

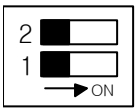
See *"Interrupt Function" in Chapter 8* for details.

ATTENTION Operation mode setting switch turns effective only on power input.

Mode Setting Switch

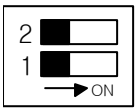
Interrupt function setting with mode setting switch on the bottom of the unit.

Mode Setting Switch



Mode	Switch No		Event
	1	2	
A	OFF	OFF	No interrupt function
B	ON	OFF	Interrupt function (INT0 to INT7)
C	OFF	ON	Interrupt generation special unit (INT0)
D	ON	ON	Unused (Reserved)

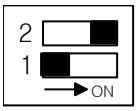
Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

➡ Interrupt function is not available at this setting.

Mode B (SW1 →ON, SW2 →OFF)

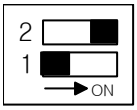


Interrupt function (8 interrupt points)

➡ Max. 8 interrupt points are available per one unit. (INT0 to INT7)

➡ In this mode, 8 interrupt points (INT0 to INT7) are automatically set regardless of ON/OFF setting of interrupt function

Mode C (SW1 →OFF, SW2 →ON)



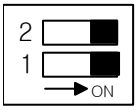
Interrupt generation special unit (1 interrupt point)

➡ Only one valid interrupt per one unit. (INT0 *1)

➡ INT1 to INT7 is invalid regardless of interrupt setting.

*1: INT0 indicates the interrupt location on the unit. Interrupt program numbers INT 16 to 23 are available for sequence program setting.

Mode D (SW1 →ON, SW2 →ON)



Reserved

➡ Do not use this setting.

IMPORTANT See *"Interrupt Points" on page 29*

Status LED

Unit LED indicates the I/O status at the terminals. Refer to the table below.

NX700 high-speed counter unit allocation table (NX-HSC4)

0	A1	A2	A3	A4	A5	A6	A7	A8	**7**
8	B1	B2	B3	B4	B5	B6	B7	B8	**F**
20	A11	A12	A13	A14	A15	A16	A17	A18	**27**
28	B11	B12	B13	B14	B15	B16	B17	B18	**2F**

[Unit LED Indicator Window]

NX700 high-speed counter unit (NX-HSC4)

LED	Functions						LED	Functions					
	Input	Interrupt	Counter	Comparison	Pulse	PWM		Output	Interrupt	Counter	Comparison	Pulse	PWM
A1	X0	-	CH0 IN-A	-	-	-	A11	Y20	-	-	[CMP0]	-	-
A2	X1	-	CH0 IN-B	-	-	-	A12	Y21	-	-	[CMP1]	-	-
A3	X2	-	CH0 Clear	-	-	-	A13	Y22	-	-	[CMP2]	-	-
A4	X3	-	CH0 Mask	-	-	-	A14	Y23	-	-	[CMP3]	-	-
A5	X4	-	CH1 IN-A	-	-	-	A15	Y24	-	-	[CMP4]	-	-
A6	X5	-	CH1 IN-B	-	-	-	A16	Y25	-	-	[CMP5]	-	-
A7	X6	-	CH1 Clear	-	-	-	A17	Y26	-	-	[CMP6]	-	-
A8	X7	-	CH1 Mask	-	-	-	A18	Y27	-	-	[CMP7]	-	-
B1	X8	INT0	CH2 IN-A	-	-	-	B11	Y28	-	-	-	-	-
B2	X9	INT1	CH2 IN-B	-	-	-	B12	Y29	-	-	-	-	-
B3	XA	INT2	CH2 Clear	-	-	-	B13	Y2A	-	-	-	-	-
B4	XB	INT3	CH2 Mask	-	-	-	B14	Y2B	-	-	-	-	-
B5	XC	INT4	CH3 IN-A	-	-	-	B15	Y2C	-	-	-	-	-
B6	XD	INT5	CH3 IN-B	-	-	-	B16	Y2D	-	-	-	-	-
B7	XE	INT6	CH3 Clear	-	-	-	B17	Y2E	-	-	-	-	-
B8	XF	INT7	CH3 Mask	-	-	-	B18	Y2F	-	-	-	-	-

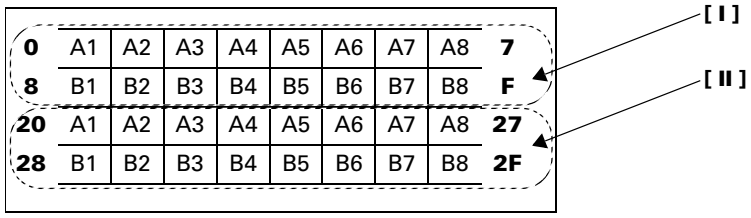
- marks: No output allocation

[ ] marks: Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

- LED indicators may show vibrations when there are high-speed I/O signals, but it does not indicate any malfunctions on the unit.
- The numbers described above are I/O numbers with high-speed counter unit mounted in slot 0.
  I/O number can differ depending on the installation slot.

NX70 high-speed counter unit allocation table (NX70-HSC4)



[Unit LED Indicator Window]

NX70 high-speed counter unit (NX70-HSC4)

LED		Functions						LED		Functions					
		Input	Interrupt	Counter	Comparison	Pulse	PWM			Output	Interrupt	Counter	Comparison	Pulse	PWM
[I]	A1	X0	-	CH0 IN-A	-	-	-	[II]	A1	Y20	-	-	[CMP0]	-	-
	A2	X1	-	CH0 IN-B	-	-	-		A2	Y21	-	-	[CMP1]	-	-
	A3	X2	-	CH0 Clear	-	-	-		A3	Y22	-	-	[CMP2]	-	-
	A4	X3	-	CH0 Mask	-	-	-		A4	Y23	-	-	[CMP3]	-	-
	A5	X4	-	CH1 IN-A	-	-	-		A5	Y24	-	-	[CMP4]	-	-
	A6	X5	-	CH1 IN-B	-	-	-		A6	Y25	-	-	[CMP5]	-	-
	A7	X6	-	CH1 Clear	-	-	-		A7	Y26	-	-	[CMP6]	-	-
	A8	X7	-	CH1 Mask	-	-	-		A8	Y27	-	-	[CMP7]	-	-
	B1	X8	INT0	CH2 IN-A	-	-	-		B1	Y28	-	-	-	-	-
	B2	X9	INT1	CH2 IN-B	-	-	-		B2	Y29	-	-	-	-	-
	B3	XA	INT2	CH2 Clear	-	-	-		B3	Y2A	-	-	-	-	-
	B4	XB	INT3	CH2 Mask	-	-	-		B4	Y2B	-	-	-	-	-
	B5	XC	INT4	CH3 IN-A	-	-	-		B5	Y2C	-	-	-	-	-
	B6	XD	INT5	CH3 IN-B	-	-	-		B6	Y2D	-	-	-	-	-
	B7	XE	INT6	CH3 Clear	-	-	-		B7	Y2E	-	-	-	-	-
	B8	XF	INT7	CH3 Mask	-	-	-		B8	Y2F	-	-	-	-	-

- marks: No output allocation

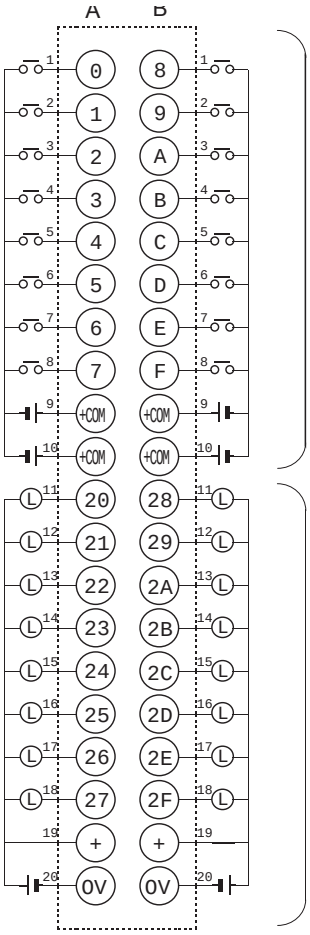
[ ] marks: Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

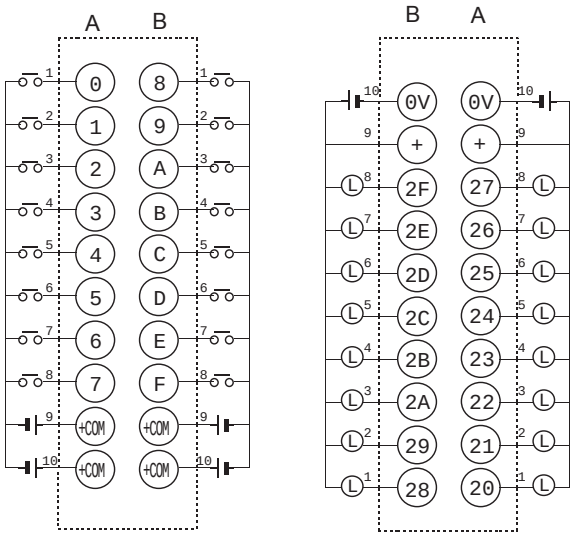
- LED indicators may show vibrations when there are high-speed I/O signals, but it does not indicate any malfunctions on the unit.
- The numbers described above are I/O numbers with high-speed counter unit mounted in slot 0.
  I/O number can differ depending on the installation slot.

I/O Specifications and Connector Pin Diagram

Terminal Diagram



[NX700 High-Speed Counter Unit (NX-HSC4)]

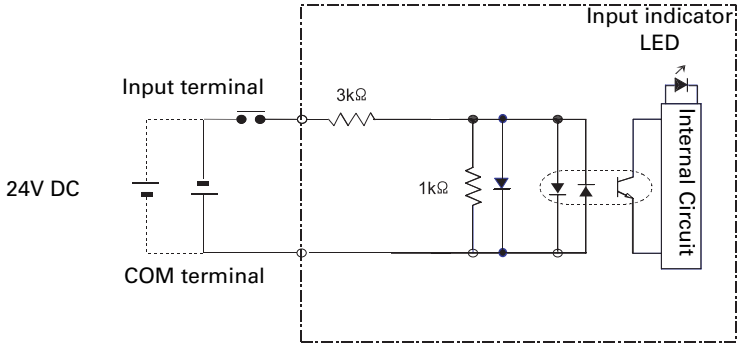


[NX70 High-Speed Counter Unit (NX70-HSC4)]

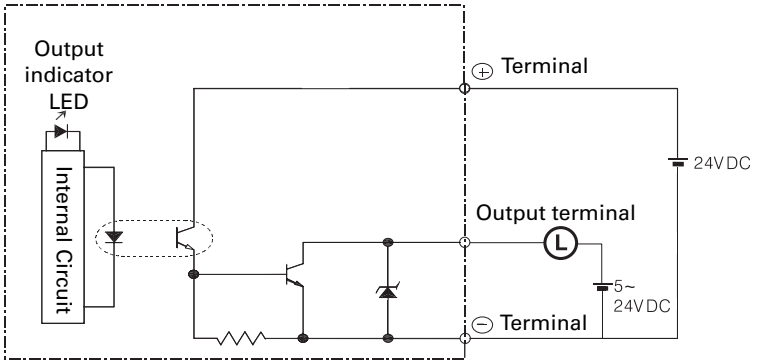
NOTE 4 (+ COM) points, 2 (+) points, and 2 (0V) points are internally connected, respectively.

Internal Circuit Diagram

Input Part



Output Part



3

Configuration and Design Verification of the Unit

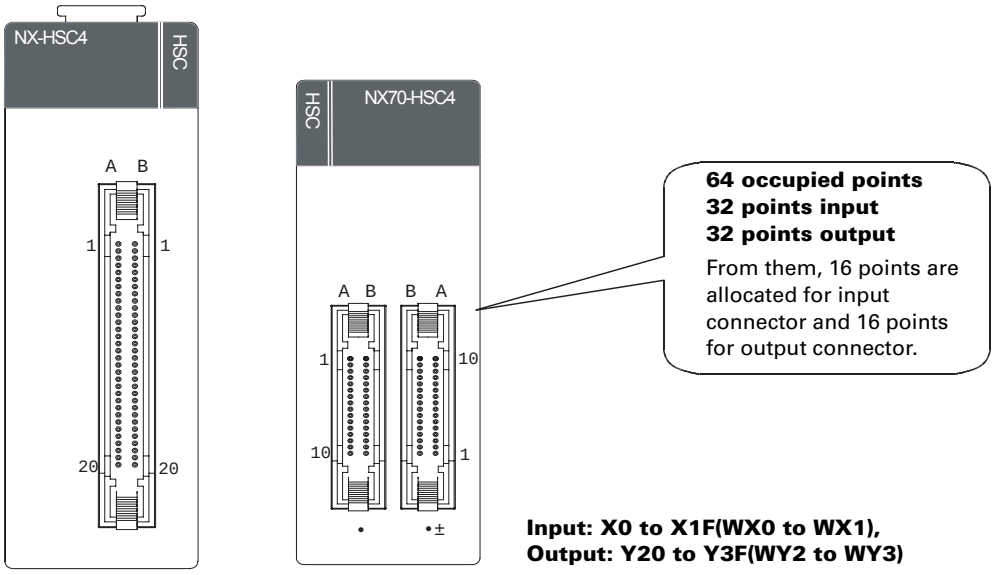
Slot No. and I/O Number Allocation Verification

Occupied I/O Area

As with other I/O units, NX70, NX700 HSC units also use the allocation for input (X)/output (Y).

NX70, NX700 HSC units occupy 32 input (X0 to X1F) and 32 output (Y20 to Y3F) points. Occupied I/O area configuration is as follows:

EX) When HSC unit is installed in slot 0



NX700 PLC High-Speed Counter Unit (NX-HSC4)

NX70 PLC High-Speed Counter Unit (NX70-HSC4)

High-Speed Counter Unit I/O Allocation Table

Input Allocation, NX700 High-Speed Counter Unit (NX-HSC4)

	External Terminal	Functions					
		Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A1	X0	-	CH0 IN-A	-	-	-
	A2	X1	-	CH0 IN-B	-	-	-
	A3	X2	-	CH0 Clear	-	-	-
	A4	X3	-	CH0 Mask	-	-	-
	A5	X4	-	CH1 IN-A	-	-	-
	A6	X5	-	CH1 IN-B	-	-	-
	A7	X6	-	CH1 Clear	-	-	-
	A8	X7	-	CH1 Mask	-	-	-
	B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
	B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
	B3	XA	Interrupt INT2	CH2 Clear	-	-	-
	B4	XB	Interrupt INT3	CH2 Mask	-	-	-
	B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
	B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
	B7	XE	Interrupt INT6	CH3 Clear	-	-	-
	B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O	-	X10	-	-	Comparison CMP0	-	-
	-	X11	-	-	Comparison CMP1	-	-
	-	X12	-	-	Comparison CMP2	-	-
	-	X13	-	-	Comparison CMP3	-	-
	-	X14	-	-	Comparison CMP4	-	-
	-	X15	-	-	Comparison CMP5	-	-
	-	X16	-	-	Comparison CMP6	-	-
	-	X17	-	-	Comparison CMP7	-	-
	-	X18	-	-	-	-	-
	-	X19	-	-	-	-	-
	-	X1A	-	-	-	-	-
	-	X1B	-	-	-	-	-
	-	X1C	-	-	-	-	-
	-	X1D	-	-	-	-	-
	-	X1E	-	-	-	-	-
	-	X1F	-	-	-	-	-

- : No input allocation.

The I/O number allocations above are applied when NX700 PLC High-speed counter unit(4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Input Allocation, NX70 High-Speed Counter Unit (NX70-HSC4)

	External Terminal		Functions					
			Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[I]	A1	X0	-	CH0 IN-A	-	-	-
		A2	X1	-	CH0 IN-B	-	-	-
		A3	X2	-	CH0 Clear	-	-	-
		A4	X3	-	CH0 Mask	-	-	-
		A5	X4	-	CH1 IN-A	-	-	-
		A6	X5	-	CH1 IN-B	-	-	-
		A7	X6	-	CH1 Clear	-	-	-
		A8	X7	-	CH1 Mask	-	-	-
		B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
		B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
		B3	XA	Interrupt INT2	CH2 Clear	-	-	-
		B4	XB	Interrupt INT3	CH2 Mask	-	-	-
		B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
		B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
		B7	XE	Interrupt INT6	CH3 Clear	-	-	-
		B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O		-	X10	-	-	Comparison CMP0	-	-
		-	X11	-	-	Comparison CMP1	-	-
		-	X12	-	-	Comparison CMP2	-	-
		-	X13	-	-	Comparison CMP3	-	-
		-	X14	-	-	Comparison CMP4	-	-
		-	X15	-	-	Comparison CMP5	-	-
		-	X16	-	-	Comparison CMP6	-	-
		-	X17	-	-	Comparison CMP7	-	-
		-	X18	-	-	-	-	-
		-	X19	-	-	-	-	-
		-	X1A	-	-	-	-	-
		-	X1B	-	-	-	-	-
		-	X1C	-	-	-	-	-
		-	X1D	-	-	-	-	-
		-	X1E	-	-	-	-	-
		-	X1F	-	-	-	-	-

- : No input allocation.

The I/O number allocations above are applied when NX700 PLC High-speed counter unit(4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Detailed Descriptions on Occupied I/O points

External Input

X0 to XF ..... **Input**

Operated as input.
It can be monitored as input even though interrupt and counter functions are in use.

INT0 to INT7 .....**Interrupt Function**

Input interrupt signal.

Generates interrupt signal from the input at I/O connector, and run the interrupt program of the ladder program. This is available only when the connection point is set to input terminal in shared memory interrupt setting.

CHx IN-A, CHx IN-B .....**Counter Function**

Input count signal of counting operation.

Count signal input is IN-A, IN-B.

There are three input modes: 1) Direction control 2) Individual input and 3) Phase input.

CHx Clear .....**Counter Function**

Input when counter current value is to be cleared.

Count current value is cleared to zero (0) with this input.

CHx Mask .....**Counter Function**

Pause counter.

When this input turns on, counter is paused.

Internal input

X10 to X1F .....**Input**

This is for monitoring signals from each function, such as comparison output.

CMP0 to CMP7 .....**Comparison Output Function**

The comparison result of comparison output set value in shared memory and counter current value can be monitored by X10 to X17.

(Counter current value) < (Comparison output set value) →Comparison output: OFF

(Counter current value) ≥ (Comparison output set value) →Comparison output: ON

Comparison output ON/OFF can also be set as reverse operation.

Output Allocation, NX700 High-Speed Counter Unit (NX-HSC4)

	External Terminal	Functions					
		Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A11	Y20	-	-	[Comparison CMP0]	-	-
	A12	Y21	-	-	[Comparison CMP1]	-	-
	A13	Y22	-	-	[Comparison CMP2]	-	-
	A14	Y23	-	-	[Comparison CMP3]	-	-
	A15	Y24	-	-	[Comparison CMP4]	-	-
	A16	Y25	-	-	[Comparison CMP5]	-	-
	A17	Y26	-	-	[Comparison CMP6]	-	-
	A18	Y27	-	-	[Comparison CMP7]	-	-
	B11	Y28	-	-	-	-	-
	B12	Y29	-	-	-	-	-
	B13	Y2A	-	-	-	-	-
	B14	Y2B	-	-	-	-	-
	B15	Y2C	-	-	-	-	-
	B16	Y2D	-	-	-	-	-
	B17	Y2E	-	-	-	-	-
	B18	Y2F	-	-	-	-	-
Unit Internal I/O	-	Y30	-	CH0 Soft Clear	-	-	-
	-	Y31	-	CH0 Soft Mask	-	-	-
	-	Y32	-	CH1 Soft Clear	-	-	-
	-	Y33	-	CH1 Soft Mask	-	-	-
	-	Y34	-	CH2 Soft Clear	-	-	-
	-	Y35	-	CH2 Soft Mask	-	-	-
	-	Y36	-	CH3 Soft Clear	-	-	-
	-	Y37	-	CH3 Soft Mask	-	-	-
	-	Y38	-	-	-	-	-
	-	Y39	-	-	-	-	-
	-	Y3A	-	-	-	-	-
	-	Y3B	-	-	-	-	-
	-	Y3C	-	-	-	-	-
	-	Y3D	-	-	-	-	-
	-	Y3E	-	-	-	-	-
	-	Y3F	-	-	-	-	-

- : No output allocation

[ ] : Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX700 PLC High-speed counter unit(4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

Output Allocation, NX70 High-Speed Counter Unit (NX70-HSC4)

	External Terminal		Functions					
			Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[II]	A1	Y20	-	-	[Comparison CMP0]	-	-
		A2	Y21	-	-	[Comparison CMP1]	-	-
		A3	Y22	-	-	[Comparison CMP2]	-	-
		A4	Y23	-	-	[Comparison CMP3]	-	-
		A5	Y24	-	-	[Comparison CMP4]	-	-
		A6	Y25	-	-	[Comparison CMP5]	-	-
		A7	Y26	-	-	[Comparison CMP6]	-	-
		A8	Y27	-	-	[Comparison CMP7]	-	-
		B1	Y28	-	-	-	-	-
		B2	Y29	-	-	-	-	-
		B3	Y2A	-	-	-	-	-
		B4	Y2B	-	-	-	-	-
		B5	Y2C	-	-	-	-	-
		B6	Y2D	-	-	-	-	-
		B7	Y2E	-	-	-	-	-
		B8	Y2F	-	-	-	-	-
Unit Internal I/O		-	Y30	-	CH0 Soft Clear	-	-	-
		-	Y31	-	CH0 Soft Mask	-	-	-
		-	Y32	-	CH1 Soft Clear	-	-	-
		-	Y33	-	CH1 Soft Mask	-	-	-
		-	Y34	-	CH2 Soft Clear	-	-	-
		-	Y35	-	CH2 Soft Mask	-	-	-
		-	Y36	-	CH3 Soft Clear	-	-	-
		-	Y37	-	CH3 Soft Mask	-	-	-
		-	Y38	-	-	-	-	-
		-	Y39	-	-	-	-	-
		-	Y3A	-	-	-	-	-
		-	Y3B	-	-	-	-	-
		-	Y3C	-	-	-	-	-
		-	Y3D	-	-	-	-	-
		-	Y3E	-	-	-	-	-
		-	Y3F	-	-	-	-	-

- : No output allocation

[ ] : Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX700 PLC High-speed counter unit(4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

Detailed Descriptions on Occupied I/O Points

External Output

Y20 to Y2F .....**Output**

Operated as output.

But, if there is high-performance output allocation, high-performance output is sent to I/O connector.

It can be used as internal relay when not being used for external output.

CMP0 to CMP7 .....**Comparison Output Function**

Comparison result output that has been calculated by comparison output functions.

This output is directly allocated to external output terminal (NX700: A11 to A18,
NX70: **[** II **]** A1 to A8), and its output (Y) (Y20 to Y27) can be used for PLS direction or internal relay. Comparison output can be monitored by internal input (X) with same name.

Internal Output

Y30 to Y3F .....**Output**

This output is a controlling signal for each functions such as counter function.

It can be used as internal relay when not allocated to any function.

CHx Soft Clear .....**Counter Function**

Output when counter current value is to be cleared.

Counter current value is cleared to zero (0) by this output (Y30, Y32, Y34, Y36).

CHx Soft Mask .....**Counter Function**

Output for counter pause.

When this output (Y31, Y33, Y35, Y37) turns on, counter is paused.

Verification of Allocated I/O Number and Slot No.

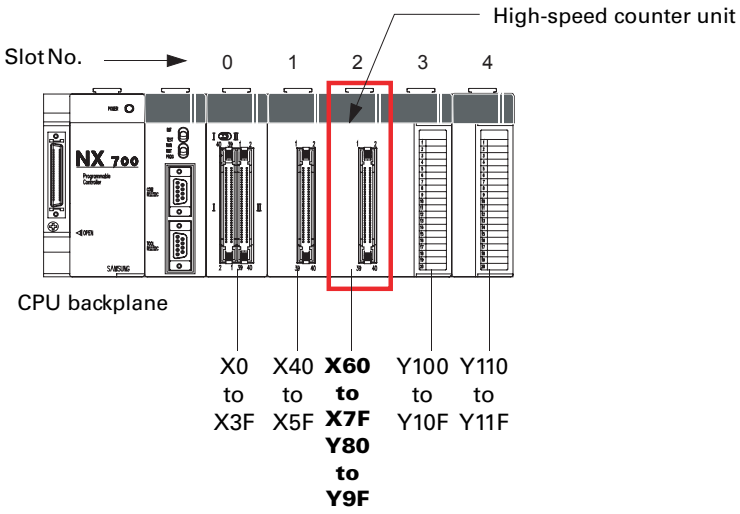
- I/O number and slot number is necessary for programming.
- I/O number changes with backplane installation location. Make sure it is same with design.
- For I/O allocation, See *"I/O Number Allocation" in Chapter 3* of each PLC system manual.

I/O Number Allocation Verification

Check the occupied I/O area of the entire unit with HSC unit.

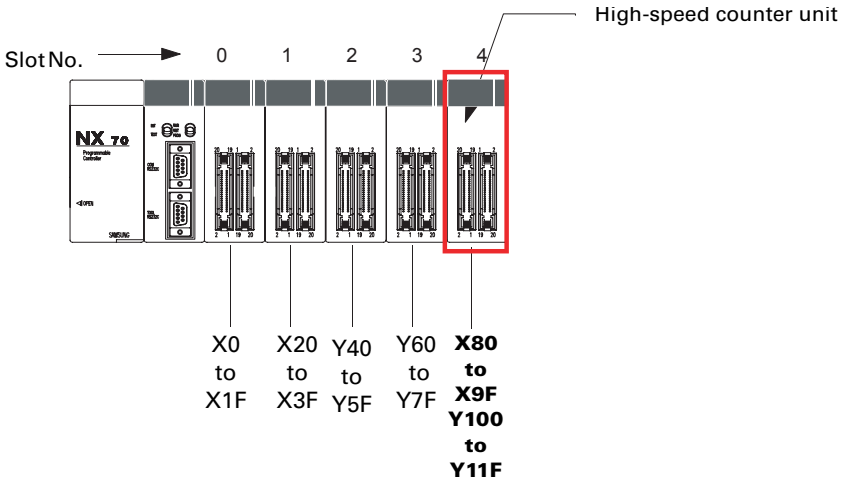
EX] When HSC unit is installed next to CPU backplane I/O unit x 2.

For NX700 PLC



EX] When HSC unit is installed next to CPU backplane I/O unit x 4.

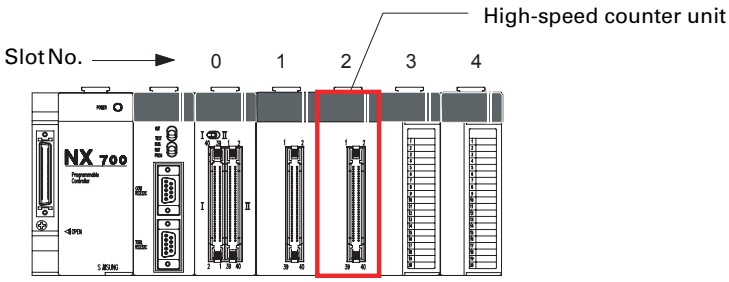
For NX70 PLC



Verification of Slot No.

When mounted on CPU backplane

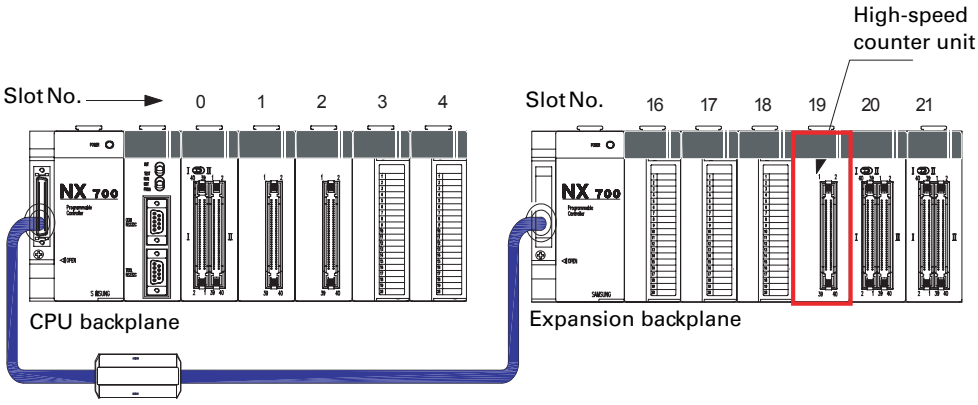
The first slot on the right of CPU is 0, and the others are numbered as their location order.



CPU backplane

When mounted on expansion backplane

Set the slot on the right of power supply unit on expansion backplane as **No. 16.**



CPU backplane

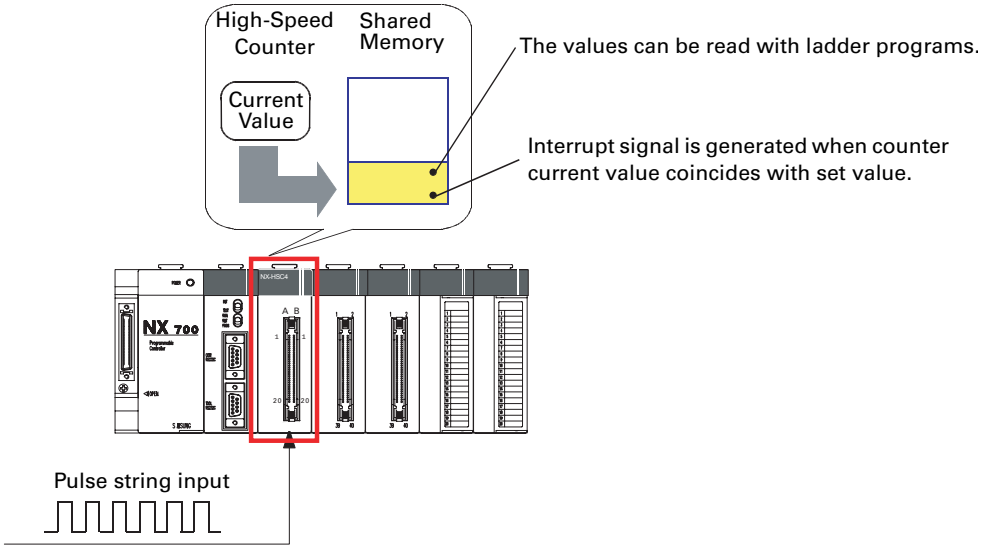
Expansion backplane

Embedded Counter

Embedded Counter Functions

Embedded Counter Functions

- Input pulse counting functions is embedded in the HSC unit.
- Counted values are stored in the shared memory areas of each channel.
- Stored values can be read by a program, so current value can be checked.
- With comparison functions, external output can be set according to count value.


High-Speed Counter
Shared Memory
Current Value
The values can be read with ladder programs.
Interrupt signal is generated when counter current value coincides with set value.
NX 700
Pulse string input

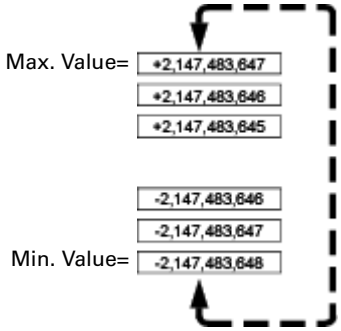
Embedded Counter Operation

- Count value is set to zero (0) on power off.
- Count value (current value) stored in shared memory can be read with user program instructions (F150/P150).
- Count value (current value) can be modified with user program instructions (F151/P151).

Count Range of the Counter

-2,147,483,648 to +2,147,483,647 (signed 32bit)

When current value exceeds max. (min.), it returns to min. (max.) without error. In this case no error occurs.



Shared Memory Address for Storing Counter Value

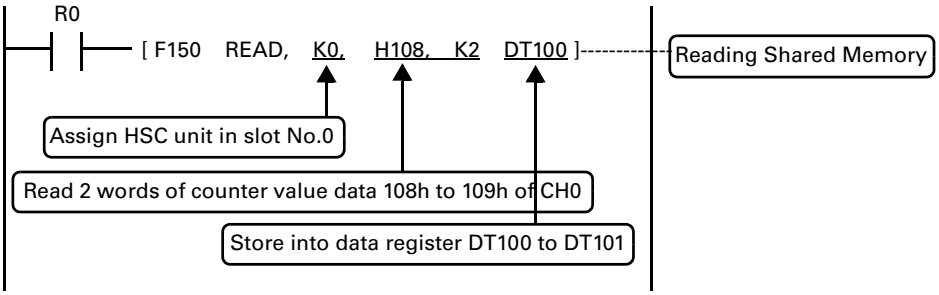
Share Memory Address (heximal)		Event	
CH0	108h, 109h	Current value count	Signed 32bit -2,147,483,648 to +2,147,483,647
CH1	10Ah, 10Bh		
CH2	10Ch, 10Dh		
CH3	10Eh, 10Fh		

Read Current Value

Use high-performance instructions (F150/P150) to read the count value (current value) from the shared memory of HSC unit.

About Instructions F150 (READ) · P150 (PREAD)

Data reading instruction from shared memory of special unit.


R0
[F150 READ, K0, H108, K2 DT100]
Reading Shared Memory
Assign HSC unit in slot No.0
Read 2 words of counter value data 108h to 109h of CH0
Store into data register DT100 to DT101

Description

Read 2 words of counter current value data of CH0, stored in shared memory of HSC unit mounted in slot 0, and store the data in DT100 to DT101 of CPU unit.

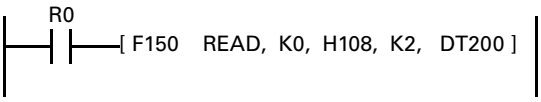
About Assigned Address

Data (current value) is stored as 32bit data.

Share Memory Address (heximal)		Event	
CH0	108h, 109h	Current value count	Signed 32bit -2,147,483,648 to +2,147,483,647
CH1	10Ah, 10Bh		
CH2	10Ch, 10Dh		
CH3	10Eh, 10Fh		

Program Example

When reading the counter current value to a certain data register (DT200)

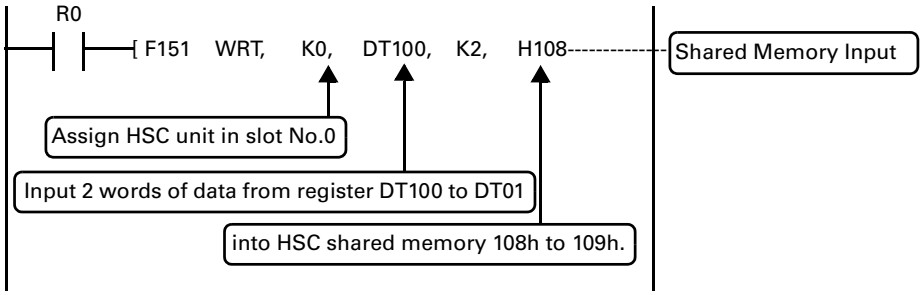


Current Value Input

Use high-performance instructions (F151/P151) to enter the count value (current value) into the shared memory of HSC unit.

About Instructions F151 (WRT) · P151 (PWRT)

Data input instruction into shared memory of special unit.


R0
[F151 WRT, K0, DT100, K2, H108
Shared Memory Input
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT01
into HSC shared memory 108h to 109h.

Description

Store 2 words of data from CPU unit DT100 to DT101 into counter current value data stored in HSC unit shared memory.

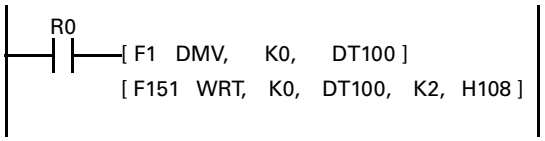
About Assigned Address

Data (current value) is stored as 32bit data.

Share Memory Address (heximal)			Event
CH0	108h, 109h	Current value count	Signed 32bit -2,147,483,648 to +2,147,483,647
CH1	10Ah, 10Bh		
CH2	10Ch, 10Dh		
CH3	10Eh, 10Fh		

Program example

When entering zero (0) into counter current value



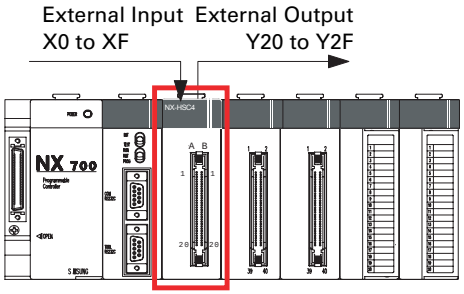
4

General I/O Function

General I/O Function

What is General I/O Function?

- General I/O function means the general I/O, represented by input and output units.
  HSC has high-performance functions like counter function, but I/O without allocations for high-performance functions is used for general I/O functions.
- When used along with input time constant functions, it can be used as I/O with input time constant functions, which provides high-performance I/O with stronger noise immunity.



- The I/O number allocations above are applied when HSC unit is installed in slot 0.

How to use General I/O Function?

All I/O of HSC unit can be used for general I/O function. But when high-performance functions are allocated, is high-performance functions allocated, such as high-speed counter function, the allocated functions have higher priority.

Using Method

- Special settings such as mode setting switch or shared memory settings are not needed for general I/O unit usage.
  Use with initial setting.

➡ When HSC unit is installed in slot 0, input X0 to XF and output Y20 to Y2F can be used for external I/O contacts.

IMPORTANT Terminals not allocated for functions can be used for general I/O, which provides system configuration without losses, including counter functions and sensor input only with a single HSC unit.

Input Time Constant Function

Input Time Constant Function

What is Input Time Constant Function?

- Setting the effective pulse width for the input signals from external input terminal. Input signal whose pulse width is smaller than the effective pulse width are considered as noise.
- Time constant can be selected from the following, and width signals over the set value are recognized as signals.

  1) 4 μs
  2) 8 μs
  3) 16 μs
  4) 32 μs

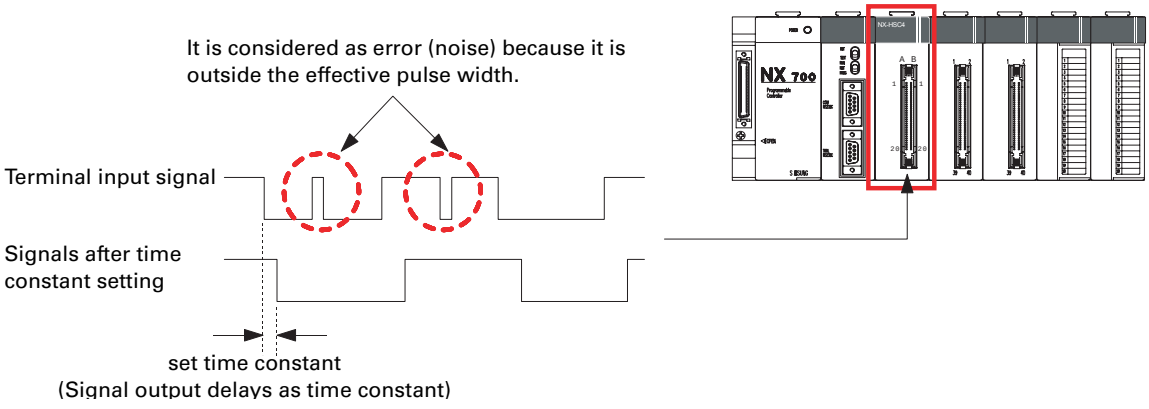
- Time constant can be set individually for each of 8 external input terminal groups.

	External input terminal	Input allocation
1)	A1, A2	X0, X1
2)	A3, A4	X2, X3
3)	A5, A6	X4, X5
4)	A7, A8	X6, X7
5)	B1, B2	X8, X9
6)	B3, B4	XA, XB
7)	B5, B6	XC, XD
8)	B7, B8	XE, XF

(NX700 High-Speed Counter Unit NX-HSC4)

	External input terminal [I]	Input allocation
1)	A1, A2	X0, X1
2)	A3, A4	X2, X3
3)	A5, A6	X4, X5
4)	A7, A8	X6, X7
5)	B1, B2	X8, X9
6)	B3, B4	XA, XB
7)	B5, B6	XC, XD
8)	B7, B8	XE, XF

(NX70 High-Speed Counter Unit NX70-HSC4)


It is considered as error (noise) because it is outside the effective pulse width.
Terminal input signal
Signals after time constant setting
set time constant
(Signal output delays as time constant)
NX 700

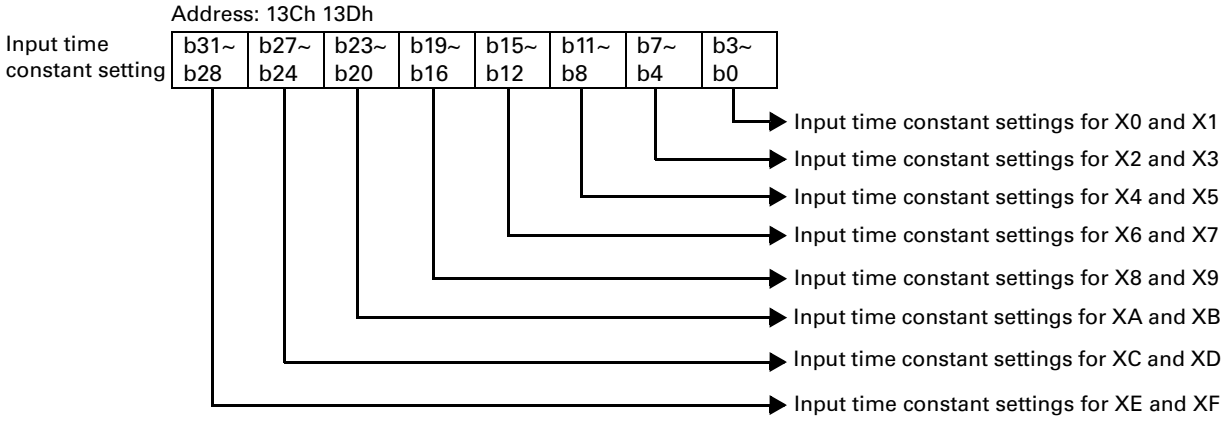
IMPORTANT Input constant functions can be used along with interrupt and counter functions.

Input Time Constant Functions

- To use input time constant functions, shared memory setting is needed.

Using Method

- Set input constant for 8 external input terminal groups by setting shared memory.
- Input time constant is set for external output terminal, so function allocation for each of input X0 to XF settings are also valid. (Counter input, interrupt input)


Address: 13Ch 13Dh
Input time constant setting
b31~ b28
b27~ b24
b23~ b20
b19~ b16
b15~ b12
b11~ b8
b7~ b4
b3~ b0
Input time constant settings for X0 and X1
Input time constant settings for X2 and X3
Input time constant settings for X4 and X5
Input time constant settings for X6 and X7
Input time constant settings for X8 and X9
Input time constant settings for XA and XB
Input time constant settings for XC and XD
Input time constant settings for XE and XF

Input Time Constant Setting

Set value (HEX)	Functions	
	Input time constant	Effective pulse width
0	Used	4 μs
1		8 μs
2		16 μs
3		32 μs
4	Invalid *1	Invalid *1
5		
6		
7		
8		
9		
A		
B		
C		
D		
E		
F	Unused *2	-

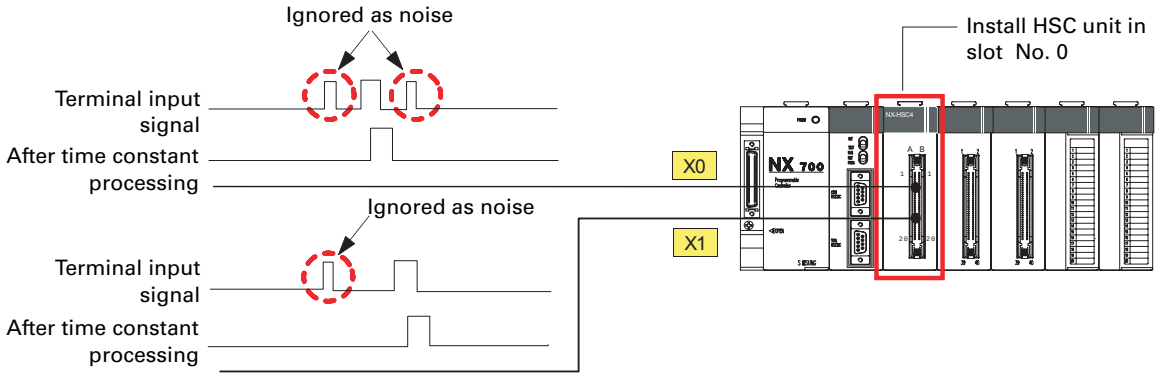
*1: Do not use this setting.

*2: Initial value on power input is set to unused.

ATTENTION Make sure to access shared memory by 2 word unit.

Use Input Time Constant Function

Overview

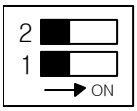


Set time constant for X0, X1 input, and ignore signals outside the width as noise.

Mode Setting Switch

Set mode A when interrupt is unused.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Input time constant function can be used regardless of the use status (used or unused) of interrupt function.

Shared Memory Setting

Time constant setting

Set input time constant.
In the example, X0, X1 time constant of 16 μs is set for X0 and X1 input. Therefore, enter「FFFFFFF2」into shared memory address 13Ch and 13Dh.

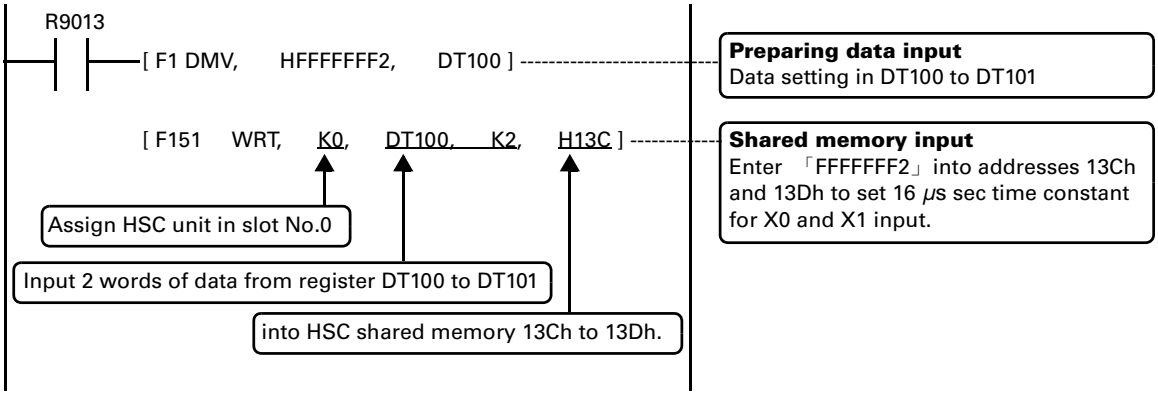
Shared memory 13Ch, 13Dh settings

(bit) 32				16 15				0
External input	XF, XE	XD, XC	XB, XA	X9, X8	X7, X6	X5, X4	X3, X2	X1, X0
Set value	F	F	F	F	F	F	F	2
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	16 μs

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Sample Program

Enter「FFFFFFF2」 into the time constant setting area of shared memory (13Ch, 13Dh), and set 16 μs time constant for X0 and X1 input.


R9013
[F1 DMV, HFFFFFFF2, DT100]
[F151 WRT, K0, DT100, K2, H13C]
Preparing data input
Data setting in DT100 to DT101
Shared memory input
Enter 「FFFFFFF2」 into addresses 13Ch and 13Dh to set 16 μs sec time constant for X0 and X1 input.
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT101
into HSC shared memory 13Ch to 13Dh.

High-Speed Counter Function

High-Speed Counter Function

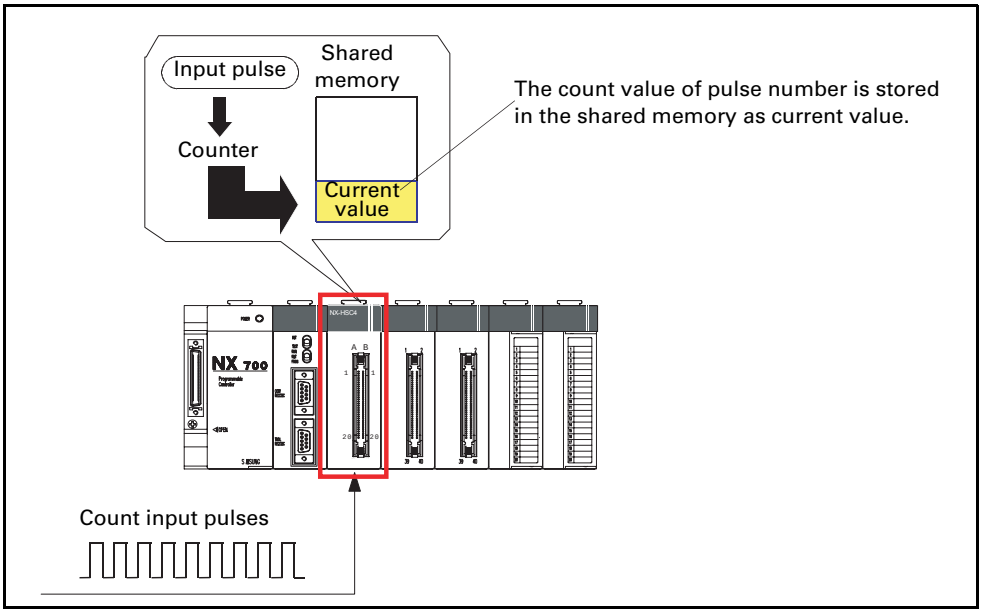
What is Counter Function?

- Counter function counts the input pulse number and reflect it into the current value. Also, it set the offset value by recording data into the current value.
- HSC unit has 4 channels of 2 phase input counter. There are three types of 2 phase input mode as follows.

  1) Direction Control Mode

  2) Individual Input Mode

  3) Phase Input Mode

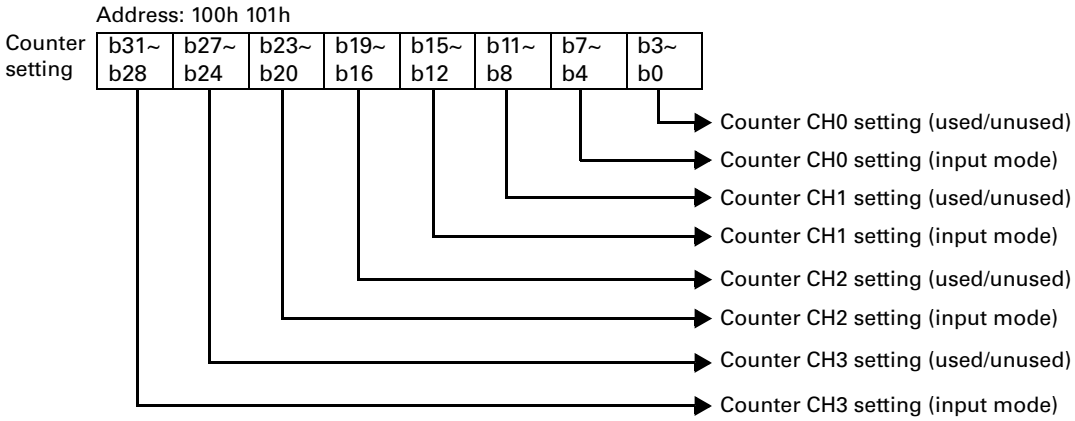


Setting Counter Function

- To use counter function, shared memory setting is needed.
- Besides shared memory setting, counter can be masked or cleared with counter control signal.

Step ①. Shared Memory Setting

Set the operation mode for each counter CH in the shared memory settings. Set the counter functions mode as shown in the table below.



Setting (Input Mode)...Effective only for terminal input

Set value (HEX)	Functions	
	Terminal input mode	Multiplication
0	Direction control *3	N/A
1	Individual input	
2	Phase input	1 multiplication
3		2 multiplications
4		4 multiplications
5	Invalid *2	
6		
7		
8		
9		
A		
B		
C		
D		
E		
F		

Setting (Function)

Set value (HEX)	Functions
	Counter
0	Used (Terminal input)
1	
2	Used (Internal connection) *1
3	
4	
5	Invalid *2
6	
7	
8	
9	
A	
B	
C	
D	
E	
F	Unused *3

*1: Do not use this setting.

*2: Initial values on power input are set as direction control for input mode and unused for function setting.

ATTENTION Make sure to access shared memory by 2 word unit.

Step ②. Counter Control Signal

- Counter functions can set mask or clear with counter control signal.
- There are two types of counter control signals as follows: **Control by external input terminal** and **Control by programming**. Both allow counter control.

Control by external input terminal

Control Signals (External input terminal)

External terminal			Input allocation	Function		
NX700	NX70			Subject counter	Control events	Remarks
A3	[I]	A3	X2	CH0	Clear	Count current value is cleared to 0 with input ON.
A4		A4	X3		Mask	Count is paused with input ON.
A7		A7	X6	CH1	Clear	Count current value is cleared to 0 with input ON.
A8		A8	X7		Mask	Count is paused with input ON.
B3		B3	XA	CH2	Clear	Count current value is cleared to 0 with input ON.
B4		B4	XB		Mask	Count is paused with input ON.
B7		B7	XE	CH3	Clear	Count current value is cleared to 0 with input ON.
B8		B8	XF		Mask	Count is paused with input ON.

Control by programming

Control Signals (Internal output terminal)

Output allocation	Function		
	Subject counter	Control events	Remarks
Y30	CH0	Clear	Count current value is cleared to 0 with output ON.
Y31		Mask	Count is paused with output ON.
Y32	CH1	Clear	Count current value is cleared to 0 with output ON.
Y33		Mask	Count is paused with output ON.
Y34	CH2	Clear	Count current value is cleared to 0 with output ON.
Y35		Mask	Count is paused with output ON.
Y36	CH3	Clear	Count current value is cleared to 0 with output ON.
Y37		Mask	Count is paused with output ON.

ATTENTION

Be careful that when counter output is internally connected, the control input (by external terminal) from I/O connector is ignored.

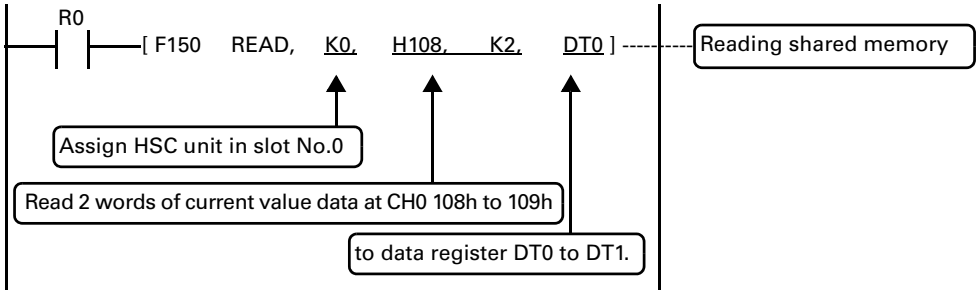
Read Counter Current Value

- Current value of each counter is stored in shared memory as described below.
- Use F150 and P150 instructions (reading data from high-performance units) to read the current value by 2 word unit.

	Address: 108h 109h
Counter CH0 Current value	K-2,147,483,648 to K+2,147,483,647
	Address: 10Ah 10Bh
Counter CH1 Current value	K-2,147,483,648 to K+2,147,483,647
	Address: 10Ch 10Dh
Counter CH2 Current value	K-2,147,483,648 to K+2,147,483,647
	Address: 10Eh 10Fh
Counter CH3 Current value	K-2,147,483,648 to K+2,147,483,647

Ex

- Following is an example of storing the current value from counter CH0 to DT0, using F150 instruction.


R0
[F150 READ, K0, H108, K2, DT0]
Reading shared memory
Assign HSC unit in slot No.0
Read 2 words of current value data at CH0 108h to 109h
to data register DT0 to DT1.

Current Value Input

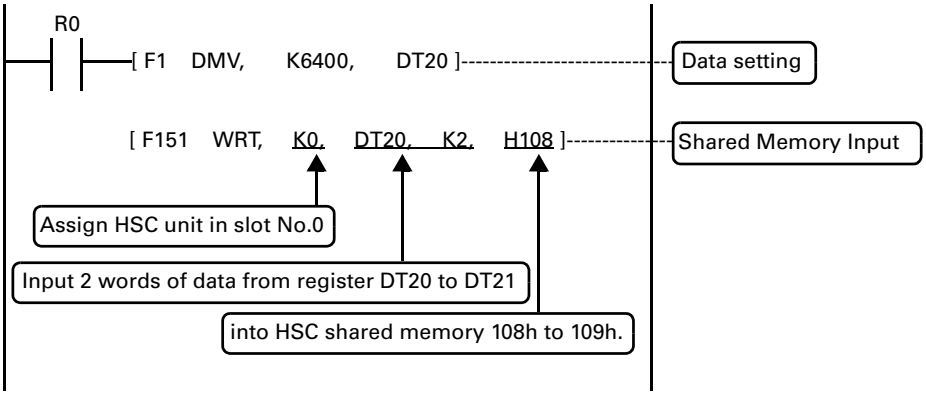
- Current value of each counter is stored in shared memory as described below.
- Enter current value by 2 word unit, using F151, P151 instruction (data writing at high-performance unit).

	Address: 108h 109h
Counter CH0 Current value	K-2,147,483,648 to K+2,147,483,647
	Address 10Ah 10Bh
Counter CH1 Current value	K-2,147,483,648 to K+2,147,483,647
	Address : 10Ch 10Dh
Counter CH2 Current value	K-2,147,483,648 to K+2,147,483,647
	Address : 10Eh 10Fh
Counter CH3 Current value	K-2,147,483,648 to K+2,147,483,647

IMPORTANT Counter offset value can be set by counter current value input.

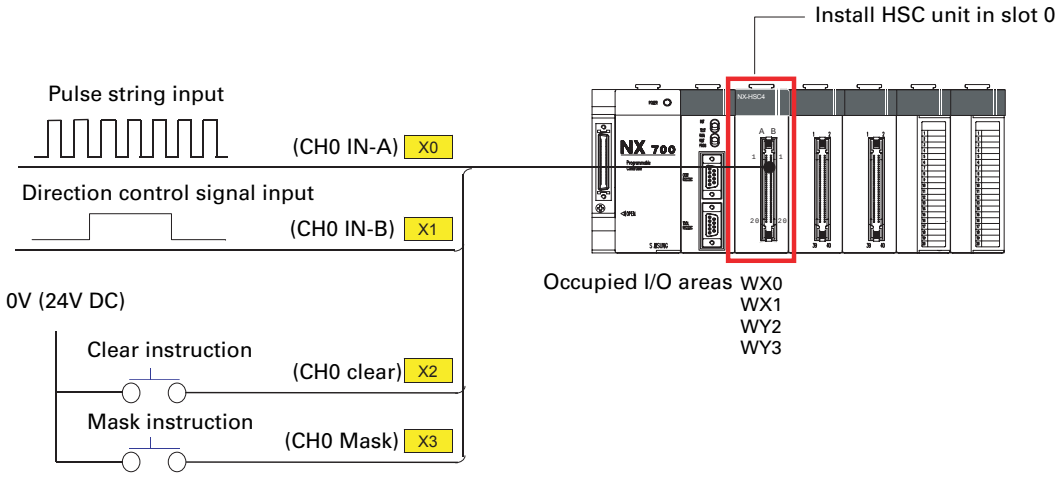
Ex

Following is an example of entering the stored input data at DT20 as counter CH0 current value, using F151 instruction.


R0
[F1 DMV, K6400, DT20]
Data setting
[F151 WRT, K0, DT20, K2, H108]
Shared Memory Input
Assign HSC unit in slot No.0
Input 2 words of data from register DT20 to DT21
into HSC shared memory 108h to 109h.

Count Function Available as Direction Control Mode

Overview

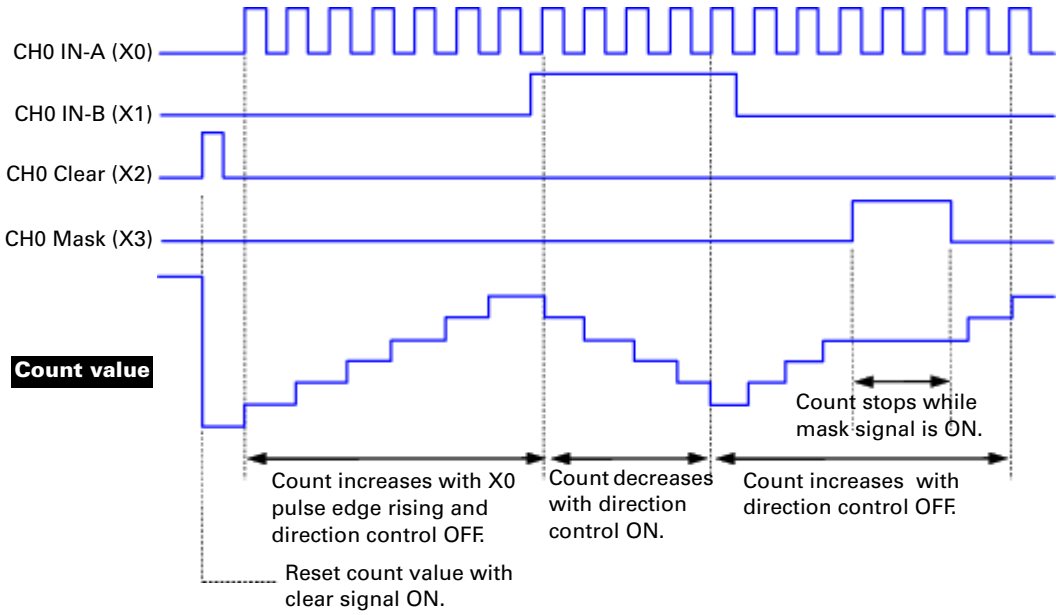


Input pulse string in X0 and direction control signal in X1 and measure the count number.

Counter current value is cleared with X2 clear instruction, and count operation is paused with X3 mask instruction.

Time Chart

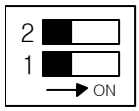
Count value changes according to the input status of each signal is illustrated below. Count value changes at the pulse input edge rise time.


CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Count value
Count stops while mask signal is ON.
Count increases with X0 pulse edge rising and direction control OFF.
Count decreases with direction control ON.
Count increases with direction control OFF.
Reset count value with clear signal ON.

Mode Setting Switch

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

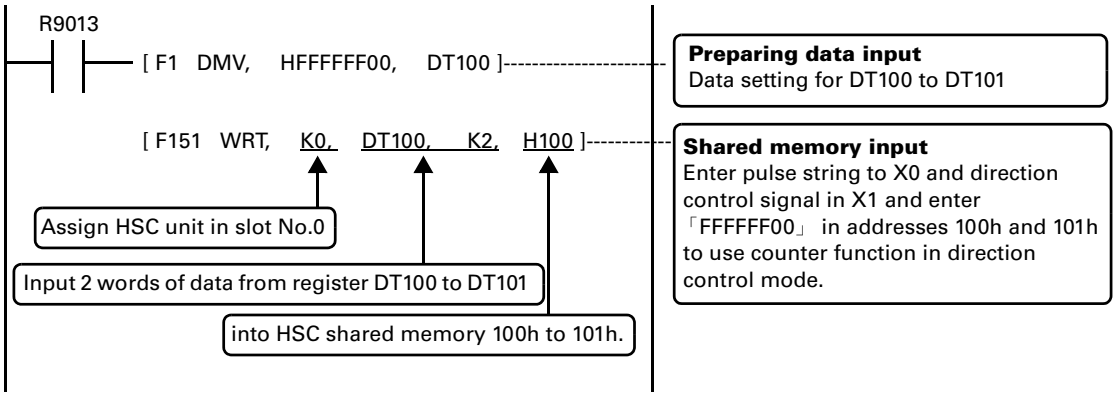
In the example, pulse string is input to X0 and direction control signal to X1, and counter function is used in direction control mode. Enter 「FFFFFF10」 to shared memory addresses 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32				16 15				0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Terminal Input

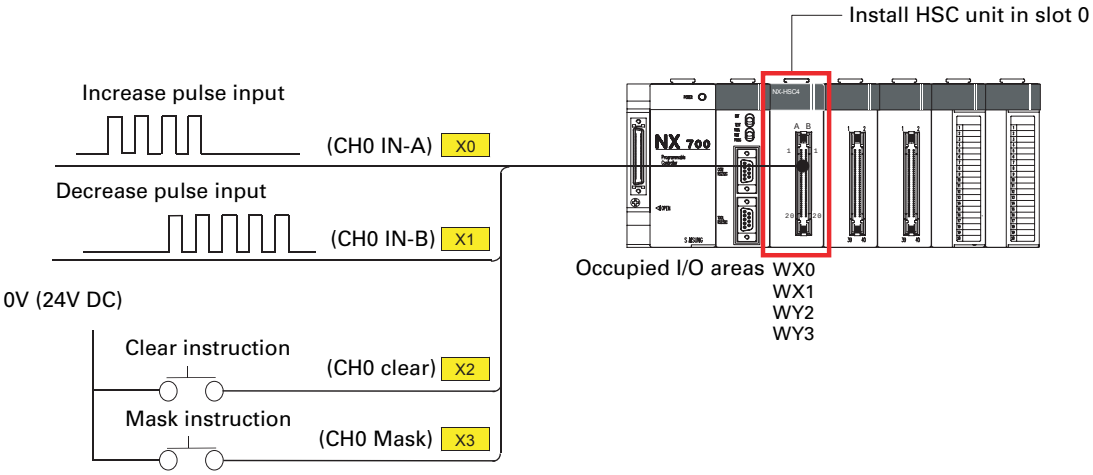
Sample Program

Enter 「FFFFFF00」 in shared memory address counter setting area (100h, 101h), and enter pulse string in X0, direction control in X1, and therefore set the counter function to direction control mode.


R9013
[F1 DMV, HFFFFFF00, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT101
into HSC shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter pulse string to X0 and direction control signal in X1 and enter 「FFFFFF00」 in addresses 100h and 101h to use counter function in direction control mode.

Count Function Available as Individual Input Mode

Overview



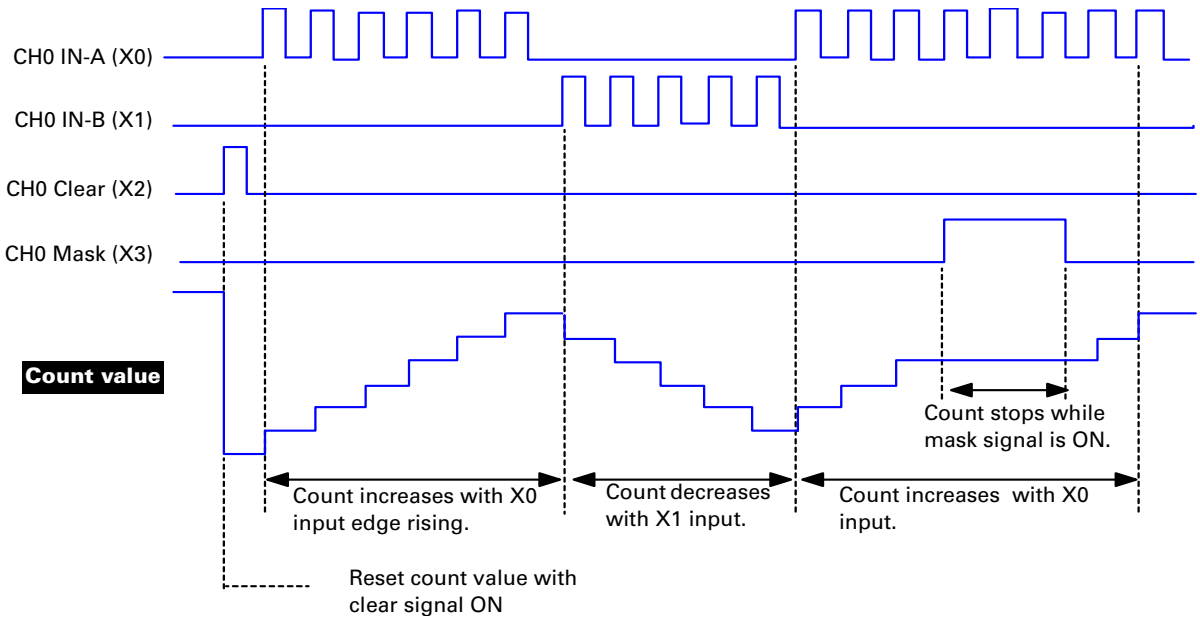
Input increase pulse in X0 and decrease pulse in X1 and measure the count number.

Counter current value is cleared with X2 clear instruction, and count operation is paused with X3 mask instruction.

Time Chart

Count value changes according to the input status of each signal as illustrated below.

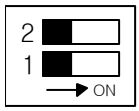
Count value changes at the edge rise time of each signal.


CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Count value
Count stops while mask signal is ON.
Count increases with X0 input edge rising.
Count decreases with X1 input.
Count increases with X0 input.
Reset count value with clear signal ON

Mode Setting Switch

Set to「Mode A」 when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

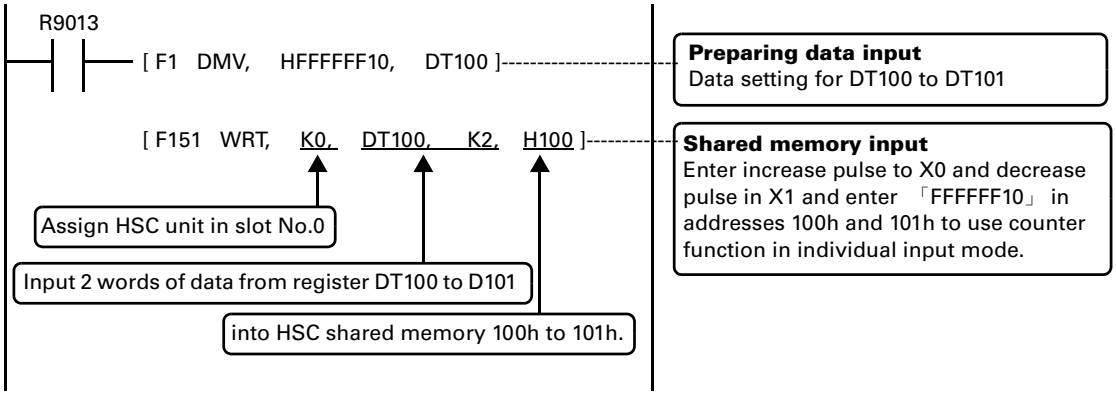
In the example, increase pulse string is input to X0 and decrease pulse string to X1, and counter function is used in individual input mode. Enter「FFFFFF00」to shared memory addresses 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32				16 15				0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	1	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Individual Input	Terminal Input

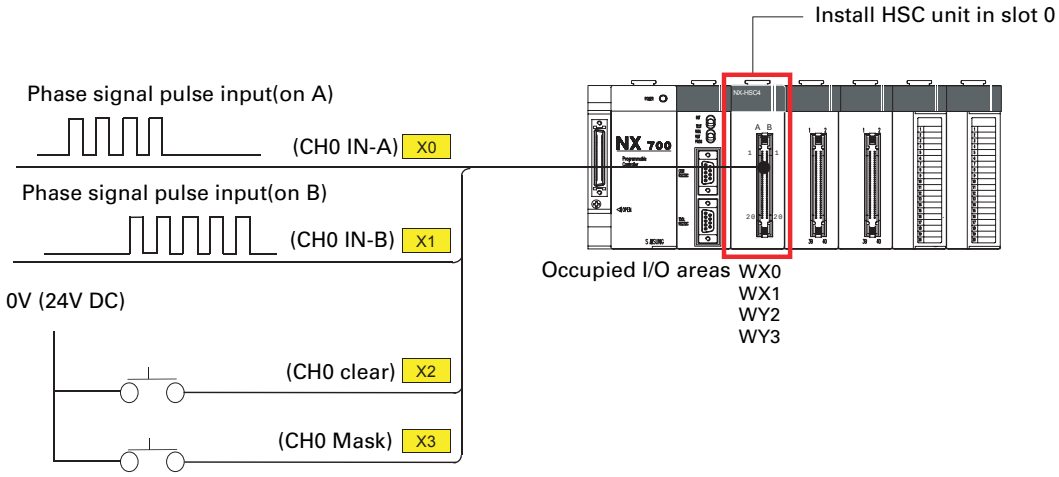
Sample Program

Enter「FFFFFF20」in shared memory address counter setting area (100h, 101h), and enter increase pulse string in X0, decrease pulse string in X1, and therefore set the counter function to individual input mode.


R9013
[F1 DMV, HFFFFFF10, DT100]
Preparing data input
Data setting for DT100 to DT101
[F151 WRT, K0, DT100, K2, H100]
Shared memory input
Enter increase pulse to X0 and decrease pulse in X1 and enter 「FFFFFF10」 in addresses 100h and 101h to use counter function in individual input mode.
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to D101
into HSC shared memory 100h to 101h.

Count Function Available as Phase Input Mode

Overview



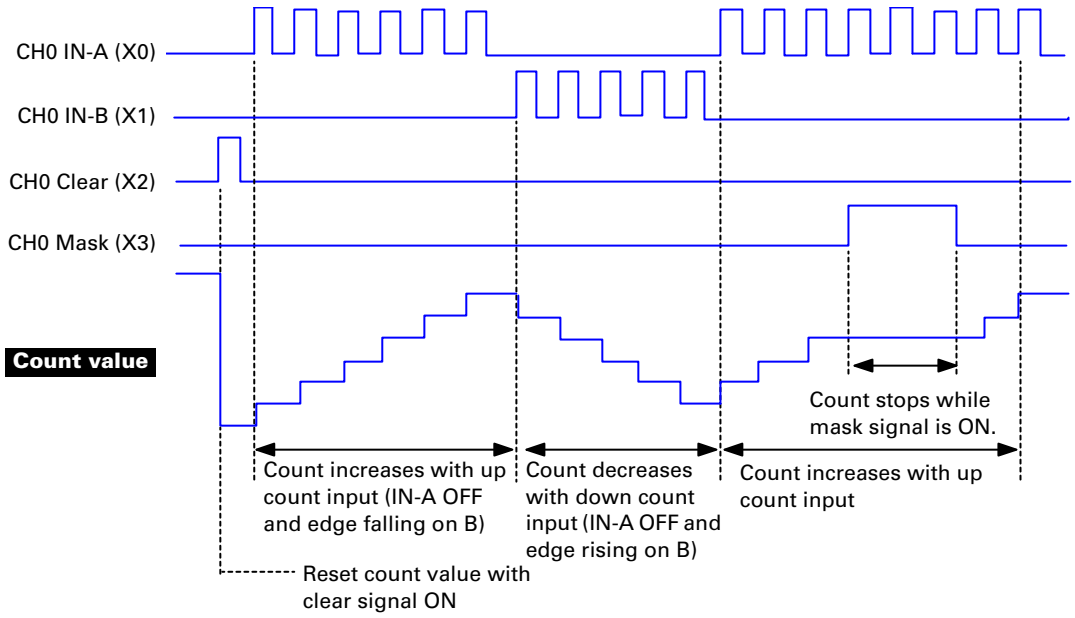
Phase signal from encoder is input to X0 and X1 and measures the count number.

Counter current value is cleared with X2 clear instruction, and count operation is paused with X3 mask instruction.

Time Chart

Count value changes according to the input status of each signal is illustrated below.

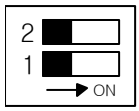
Count value increase with IN-A OFF and IN-B edge falling with 1 multiplication, and decrease with IN-A OFF and IN-B edge rising.


CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Count value
Count stops while mask signal is ON.
Count increases with up count input (IN-A OFF and edge falling on B)
Count decreases with down count input (IN-A OFF and edge rising on B)
Count increases with up count input
Reset count value with clear signal ON

Mode Setting Switch

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

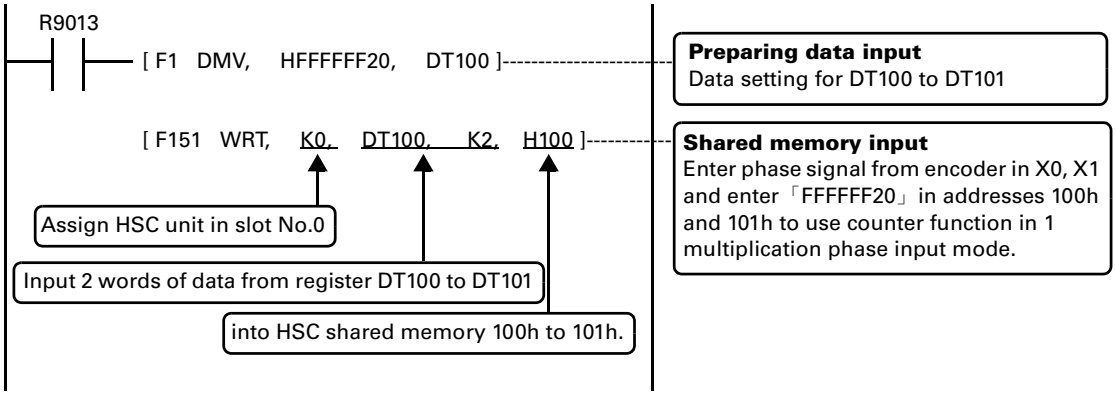
In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, and therefore enter「FFFFFF20」to shared memory addresses 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32				16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase Input	Terminal Input

Sample Program

Enter 「FFFFFF00」in shared memory address counter setting area (100h, 101h), and enter increase pulse string in X0, decrease pulse string in X1, and therefore set the counter function to individual input mode.


R9013
[F1 DMV, HFFFFFF20, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT101
into HSC shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter phase signal from encoder in X0, X1 and enter「FFFFFF20」in addresses 100h and 101h to use counter function in 1 multiplication phase input mode.

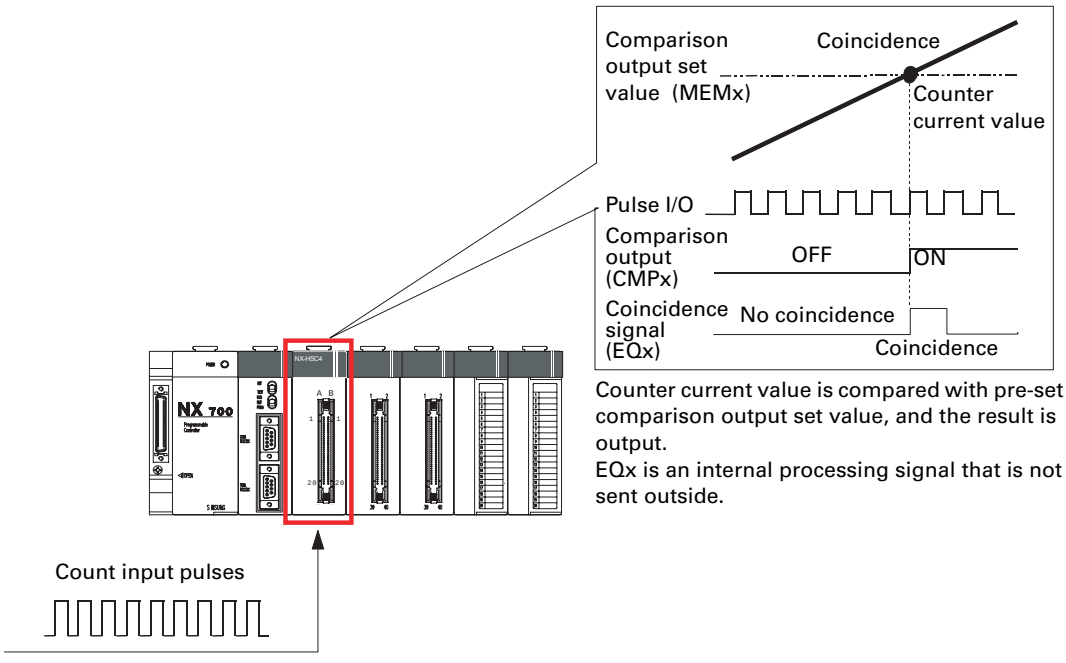
IMPORTANT In phase differential input mode, the input pulse magnification can be changed with multiplication function. See *"High-speed Counter Function" on Chapter 2* for details .

Comparison Output Function

Comparison Output Function

What is Comparison Output Function?

- Compare the comparison output set value and counter current value, and the comparison result is output.
  Comparison result output [CMPx]:
  Comparison output set value ≤Counter current value
- Comparison result output can be selected from either ON when current value < set value or current value ≥ set value.
- For HSC unit, 8 types of comparison output set values can be set, and the comparison counter channels can also be freely selected. Therefore, if all comparison output set values are set to a single counter, a maximum of 8 level comparisons are available.



Counter current value is compared with pre-set comparison output set value, and the result is output.
EQx is an internal processing signal that is not sent outside.

Setting Comparison Output Function

To use comparison output function, **SETP 1. Shared Memory Setting for Comparison Output Set Value** and **STEP 2. Shared Memory Setting for Comparison Output Point** are needed.

Step ①. Shared Memory Setting for Comparison Output Set Value

Set the comparison output set value to be compared with counter current value.

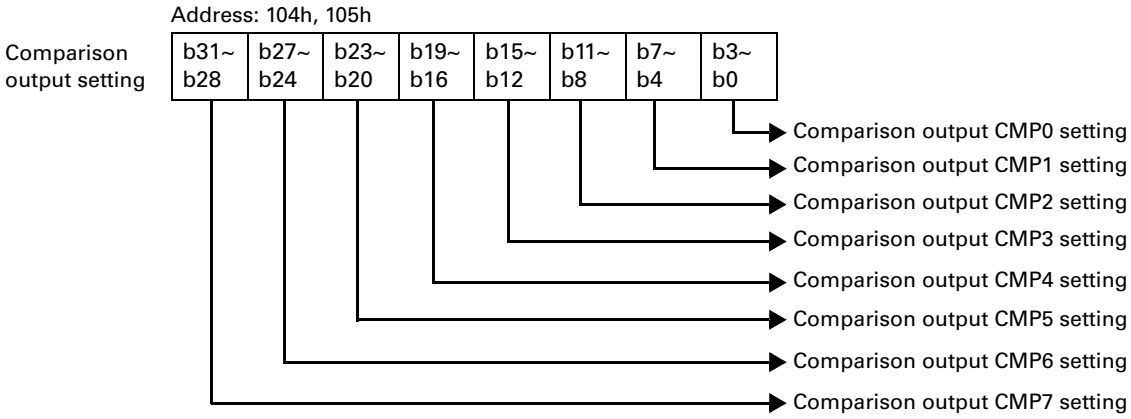
Comparison output set value (for CMP0)	MEM0	Address: 120h 121h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP1)	MEM1	Address: 122h 123h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP2)	MEM2	Address: 124h 125h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP3)	MEM3	Address: 126h 127h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP4)	MEM4	Address: 128h 129h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP5)	MEM5	Address: 12Ah 12Bh K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP6)	MEM6	Address: 12Ch 12Dh K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP7)	MEM7	Address: 12Eh 12Fh K-2,147,483,648 to K+2,147,483,647

ATTENTION Make sure to access shared memory by 2 word unit.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Step ②. Shared Memory Setting for Comparison Output Point

Select the counter CH to be compared with comparison output set value, and output logic.



Comparison Output Setting

Set value (HEX)	Functions		
	Comparison output function	Output logic	Counter CH to be compared
0	Used	ON when current value < set value	CH0
1			CH1
2			CH2
3			CH3
4		ON when current value ≥ set value	CH0
5			CH1
6			CH2
7			CH3
8	Invalid *1	Invalid *1	
9			
A			
B			
C			
D			
E			
F	Unused *2	-	

*1: Do not use this setting.

*2: Initial values on power input are set as unused.

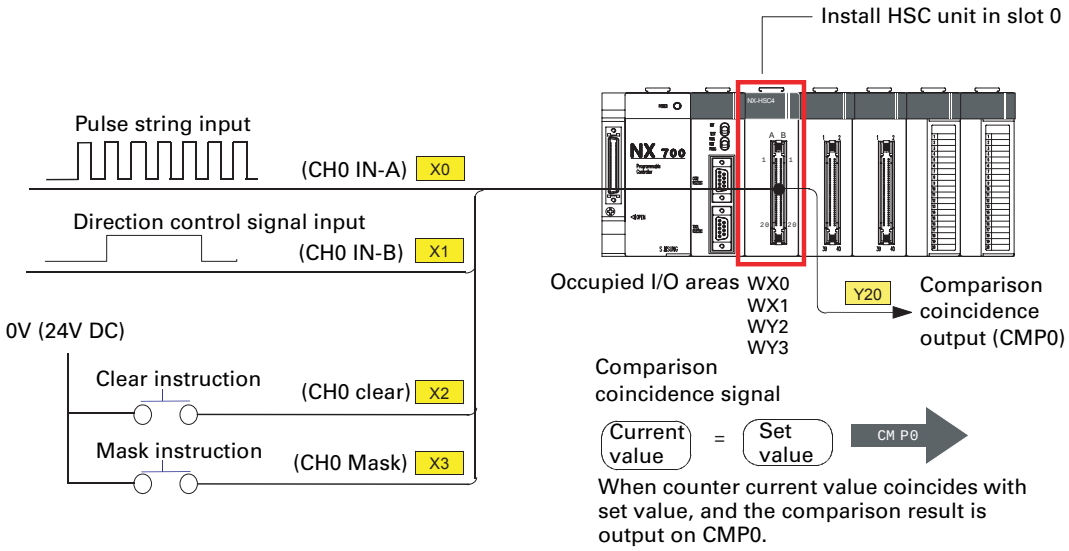
ATTENTION

- Make sure to access shared memory by 2 word unit.
- When using this setting regardless of counter function use setting (ON/OFF), be careful that comparison output set value and counter current value are compared.
- When setting the comparison output function, make sure to first set shared memory for Comparison Output Set Value. Otherwise, coincidence output is generated at the time of data setting if the comparison output condition is met, as in the case that counter initial value and comparison output set value are both 0.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Comparison Output Function with Counter

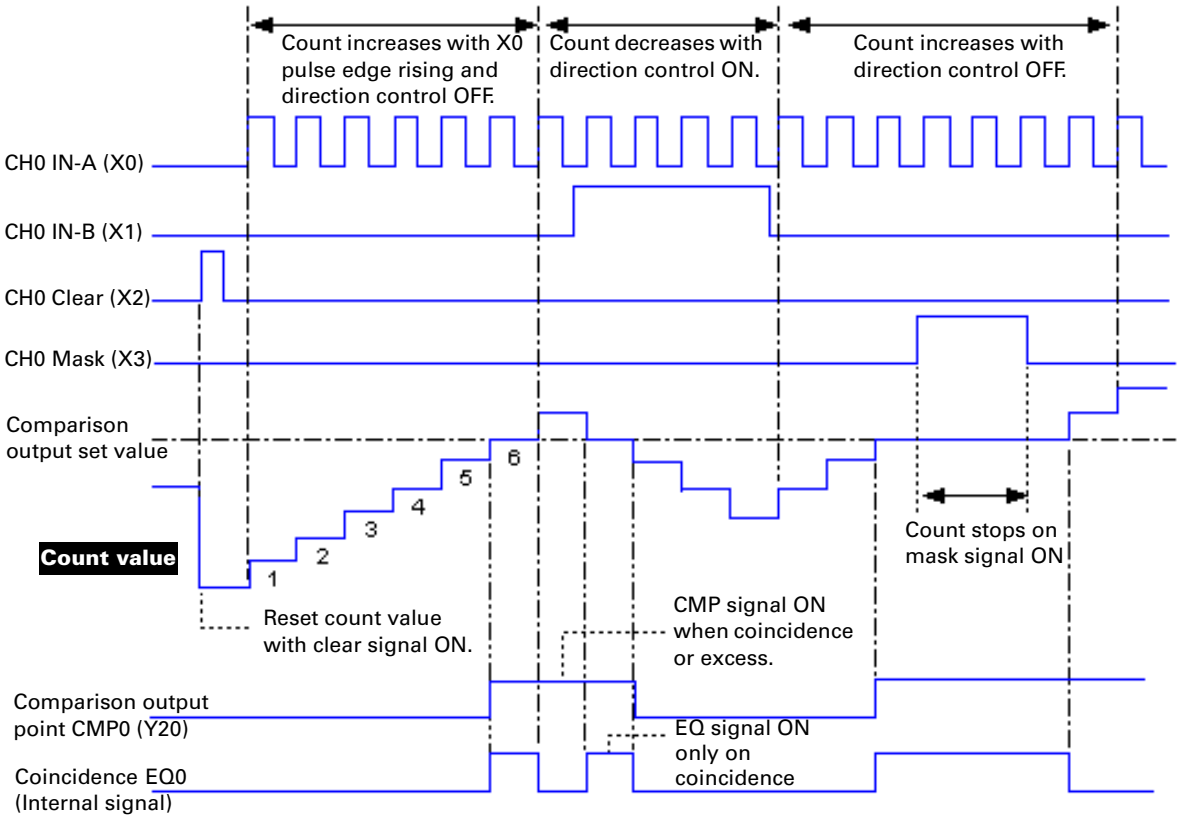
Overview



Counter current value is compared with pre-set comparison output set value, and the comparison result is output. This function is available in all counter operation modes, but in this example the counter is used in direction control mode.

Time Chart

Count value changes according to the input status of each signal as illustrated below.



Mode Setting Switch

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)

No interrupt function

Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.

In the example, pulse string is input to X0 and direction control signal to X1, and counter function is used in direction control mode. Enter 「FFFFFF00」 to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction Control	Terminal Input

Setting the Comparison Output Set Value

Setting the comparison output set value to be compared with Counter current value.

In the example, the comparison result is output on CMPO when counter current value is 6. Enter 「K6(H6)」 in shared memory addresses 120h, 121h.

Shared Memory 120h, 121h Settings

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	0	0	6
Settings	K6							

Setting the Comparison Output Point

Select the counter channel number and output logic for each comparison output point.

In the example, counter current value at CH0 is compared with comparison output set value and the comparison result is output on CMP0. Therefore, enter 「FFFFFFF4」in shared memory addresses 104h and 105h.

Shared Memory 104h, 105h Settings

(bit) 32				16 15				0
Comparison input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	F	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	CH0 Comparison *

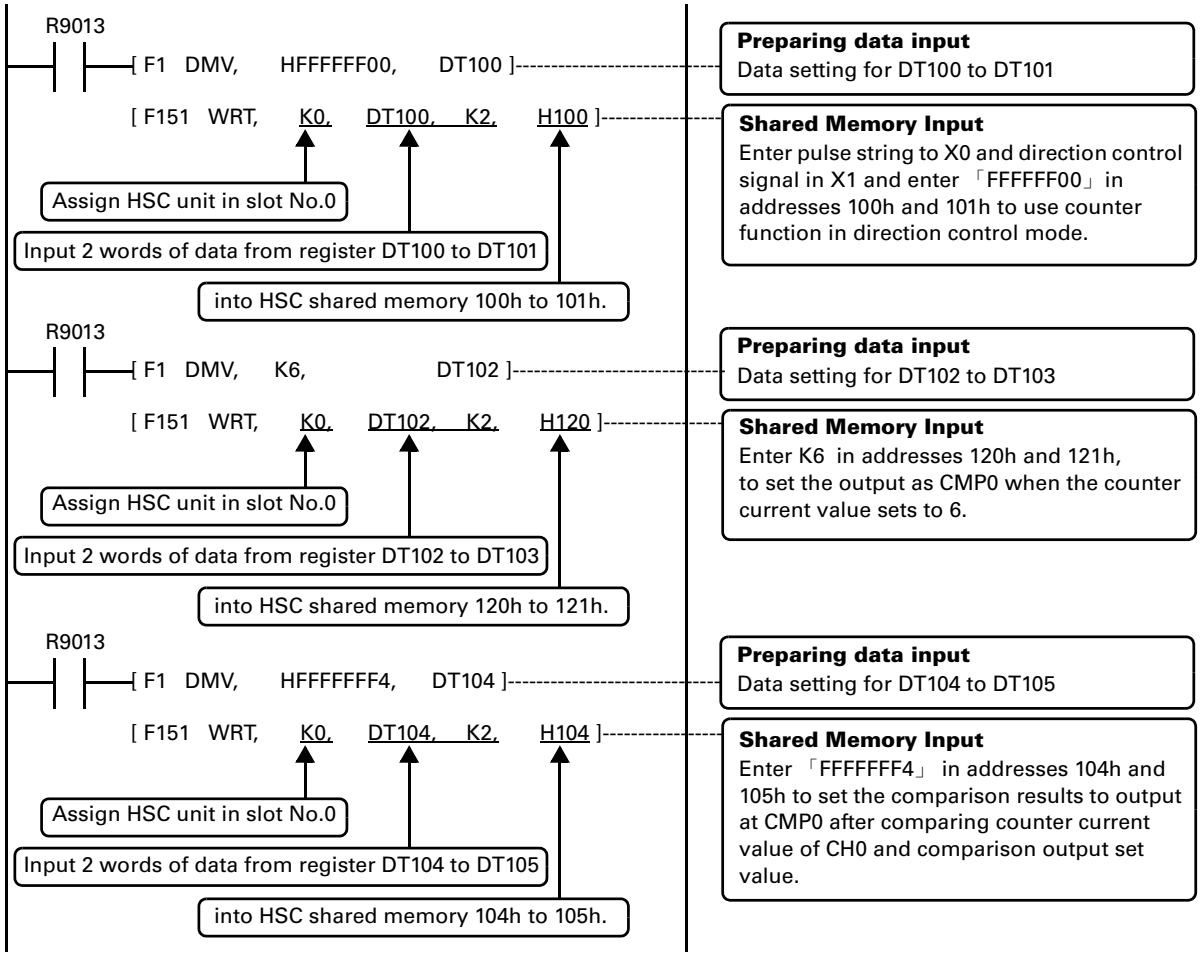
* CMP0 is ON when current value ≥ set value

ATTENTION

When setting the comparison output function, make sure to first set shared memory for Comparison Output Set Value. Otherwise, coincidence output is generated at the time of data setting if the comparison output condition is met, as in the case that counter initial value and comparison output set value are both 0.

Sample Program

Setting counter mode setting, comparison output functions in shared memory.


R9013
[F1 DMV, HFFFFFF00, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT101
into HSC shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared Memory Input
Enter pulse string to X0 and direction control signal in X1 and enter 「FFFFFF00」in addresses 100h and 101h to use counter function in direction control mode.
R9013
[F1 DMV, K6, DT102]
[F151 WRT, K0, DT102, K2, H120]
Assign HSC unit in slot No.0
Input 2 words of data from register DT102 to DT103
into HSC shared memory 120h to 121h.
Preparing data input
Data setting for DT102 to DT103
Shared Memory Input
Enter K6 in addresses 120h and 121h, to set the output as CMP0 when the counter current value sets to 6.
R9013
[F1 DMV, HFFFFFFF4, DT104]
[F151 WRT, K0, DT104, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT104 to DT105
into HSC shared memory 104h to 105h.
Preparing data input
Data setting for DT104 to DT105
Shared Memory Input
Enter 「FFFFFFF4」 in addresses 104h and 105h to set the comparison results to output at CMP0 after comparing counter current value of CH0 and comparison output set value.

Interrupt Function

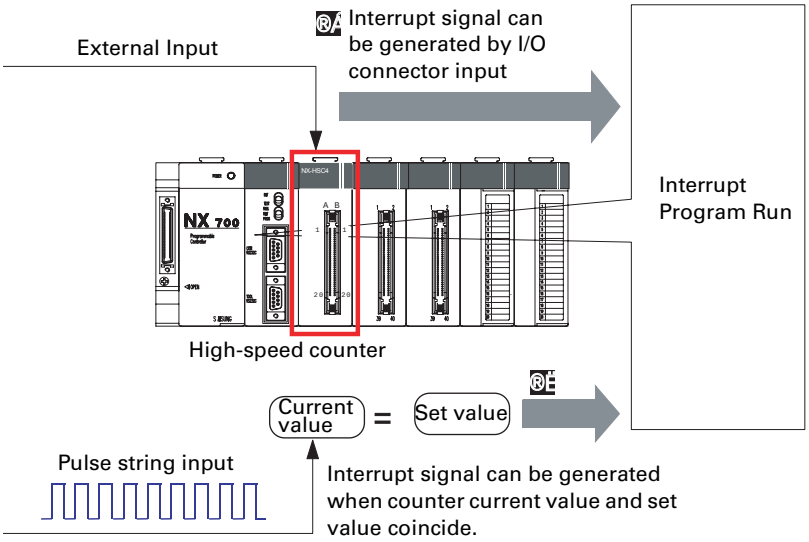
Interrupt Function

What is Interrupt Function?

- This function runs pre-set interrupt program based on the interrupt signals generated at pulse I/O unit.
- HSC unit can be used either interrupt unit with 8 point interrupt or interrupt generation high-performance unit with 1 point interrupt.
- HSC unit enables user to select the connection point (condition) that generates interrupt signal.

① Interrupt signal generation by I/O connector input

② Interrupt signal generation by coincidence of counter current value and comparison output set value



ATTENTION

Interrupt output by counter coincidence is generated when the current value and comparison output set value coincide, regardless of up or down count.

Setting Interrupt Function

To use interrupt function, **Step ①. Mode Setting Switch Setting** and **Step ② Shared Memory Setting** are needed. Mode setting switch settings become effective on power input.

Step ① Mode Setting Switch Setting

Mode setting switch is needed for interrupt function.

Select one of the following, according to the *"Mode Setting Switch" in Chapter 2*.

Mode B (SW1 →ON, SW2 →OFF)

Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, the unit is automatically set to 8 interrupt points (INT0 to INT7) regardless of interrupt functions use (ON/OFF).

Mode C (SW1 →OFF, SW2 →ON)

Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt settings.

*1: INT0 indicates the interrupt location on the unit. Numbers of interrupt programs that can be set by the program are INT16 to 23.

IMPORTANT

Interrupt functions available and interrupt generation special unit

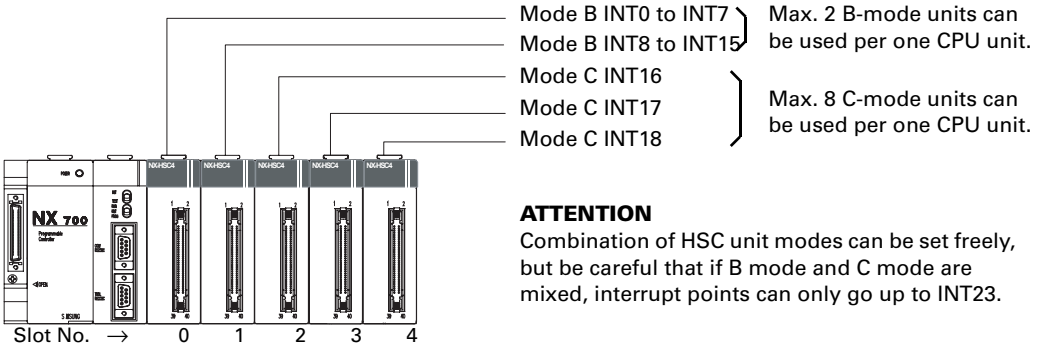
Interrupt functions available

- HSC unit set to mode B is used as interrupt unit and provides 8 interrupts per each unit.
- Be careful that only two mode B units can be used for one CPU unit.

Interrupt generation special unit

- HSC unit set to mode C is used as interrupt generation special unit and provides 1 interrupt per each unit.
- Be careful that only 8 interrupt generation special units can be used per one CPU unit.

Interrupt functions with multiple high-speed counter units

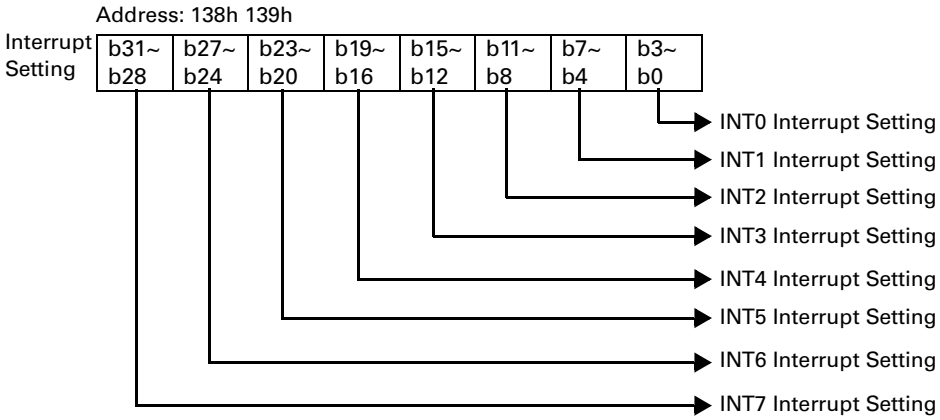


ATTENTION

Combination of HSC unit modes can be set freely, but be careful that if B mode and C mode are mixed, interrupt points can only go up to INT23.

Step ② Shared Memory Setting

Shared memory setting is needed along with mode switch setting.
Set interrupt function mode according to the table below.



Set value (HEX)	Functions		
	Interrupt function	Connection point	Interrupt condition
0	Used	Comparison output function *1 (CMP0 to CMP7)	Coincidence output
1			
2		Input terminal (X8 to XF)	off →on
3			on →off *2
4	Invalid *3	Invalid *3	Invalid *3
5			
6			
7			
8			
9			
A			
B			
C			
D			
E			
F	Unused *4	-	-

*1: Each of INT0 to INT7 corresponds to each of CMP0 to CMP7.

<Ex> When Set Value 1 is selected for INT0 interrupt setting, interrupt generates on coincidence output (EQ0) at CMP0

*2: Make sure to run interrupt clear instruction after this setting.

*3: Do not set the set value of H4 to HE

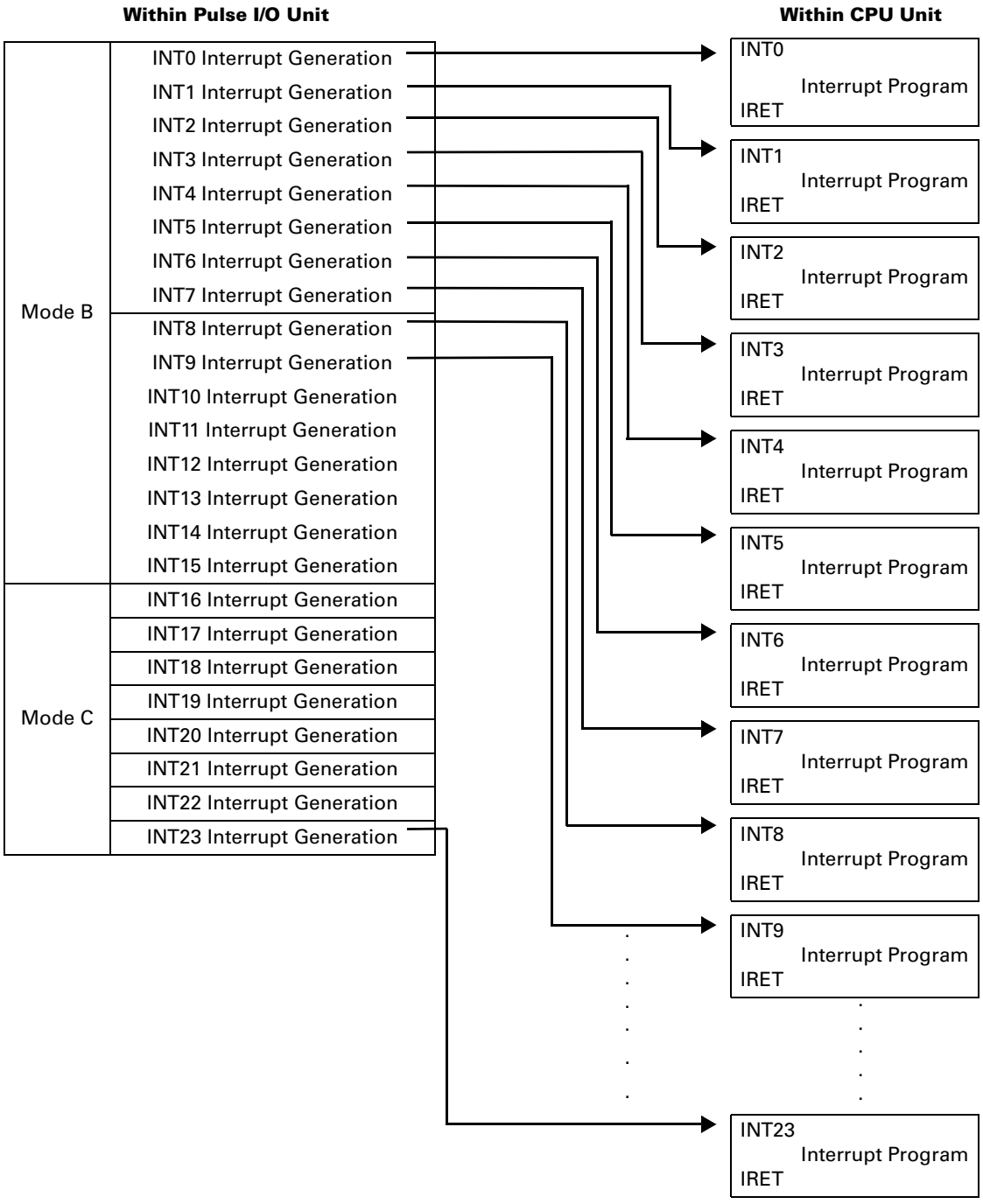
*4: Initial value on power input is set to unused.

ATTENTION Make sure to access shared memory by 2 word unit.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Relations Between Interrupt Input Number and Interrupt Program

HSC unit interrupt and interrupt program of sequence program run in link with each other.
When interrupt is generated at unit INT0 as shown below, the interrupt programs of INT0 to IRET of sequence program boot up.

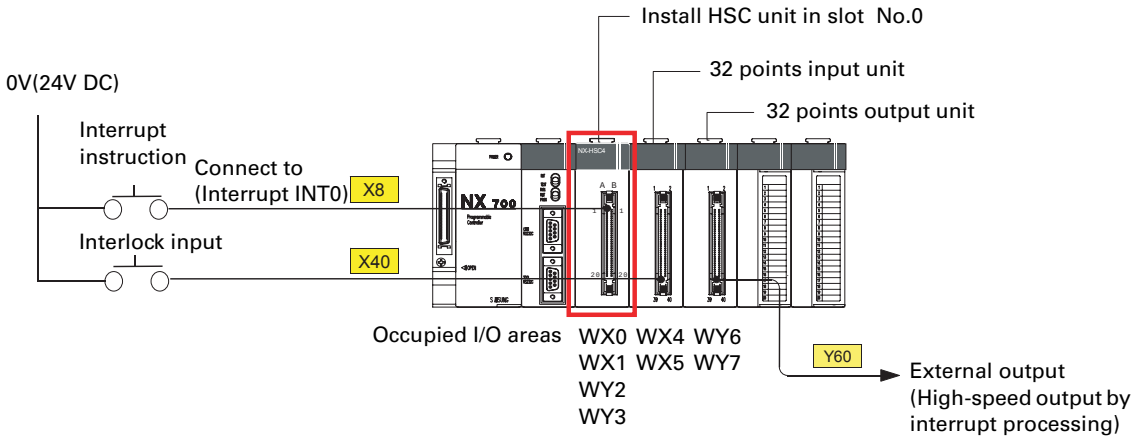


When set to mode C, the assignable interrupt program numbers for sequence program are INT 16 to 23.

NOTE Refer to Programming II manual for detailed description of interrupt programs.

Interrupt Functions (External Input)

Overview

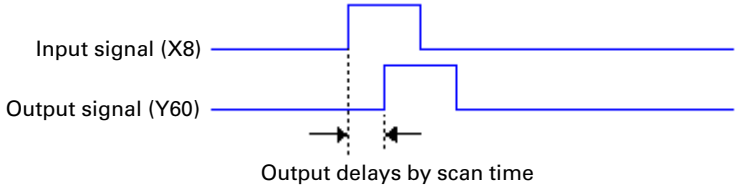


When X8 interrupt (INTO) is entered with interlock X40 input, the Y60 output is sent out at high-speed due to interrupt processing.

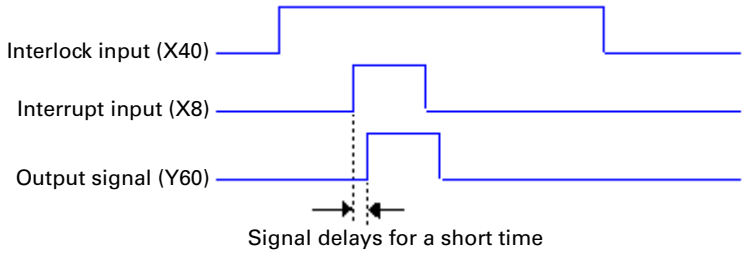
Time Chart

In general processing without interrupt, the time between input and signal output is affected by scan time. But if interrupt is processed, the input status is not affected by scan time but delays signal for a short time.

General Processing



Interrupt Processing



Mode Setting Switch Setting

In this example, set the switch to mode B where max. 8 interrupt points of INT0 to INT7 are available. If only one point is needed per unit set to mode C. Be careful that in mode C, signal will set to INT 16.

Mode B (SW1 →ON, SW2 →OFF)

Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, the unit is automatically set to 8 interrupt points unit regardless of interrupt function use settings (ON/OFF).

Mode C (SW1 →OFF, SW2 →ON)

Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt settings.

*1: INT0 indicates the interrupt location on the unit. Numbers of interrupt programs that can be set by the sequence program are INT16

Shared Memory Setting

Interrupt Setting

When using interrupt function, shared memory setting is needed as well the setting of mode setting switch on the bottom of the unit. In the example, the external input at X8 generates interrupt signal on edge rising (off →on), so enter「FFFFFFF2」in shared memory addresses 138h and 139h.

Shared Memory 138h, 139h Settings

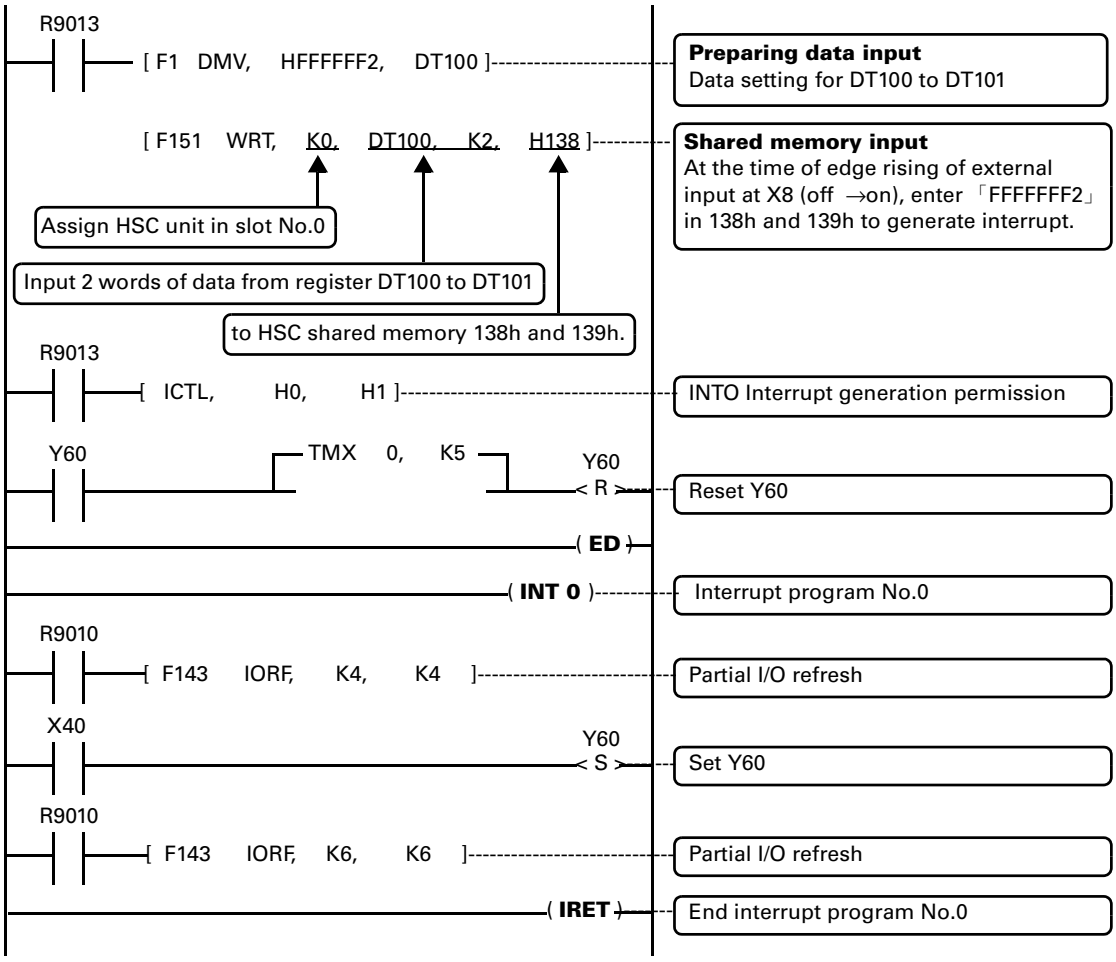
(bit) 32					16 15			0
External input	XF	XE	XD	XC	XB	XA	X9	X8
Counter number	INT7	INT6	INT5	INT4	INT3	INT2	INT1	INT0
Set value	F	F	F	F	F	F	F	2
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	off →on

Sample Program

Enter FFFFFFFF2 into the area of interrupt setting (138h, 139h) in shared memory addresses, and set the interrupt at external input (off →on) of X8.

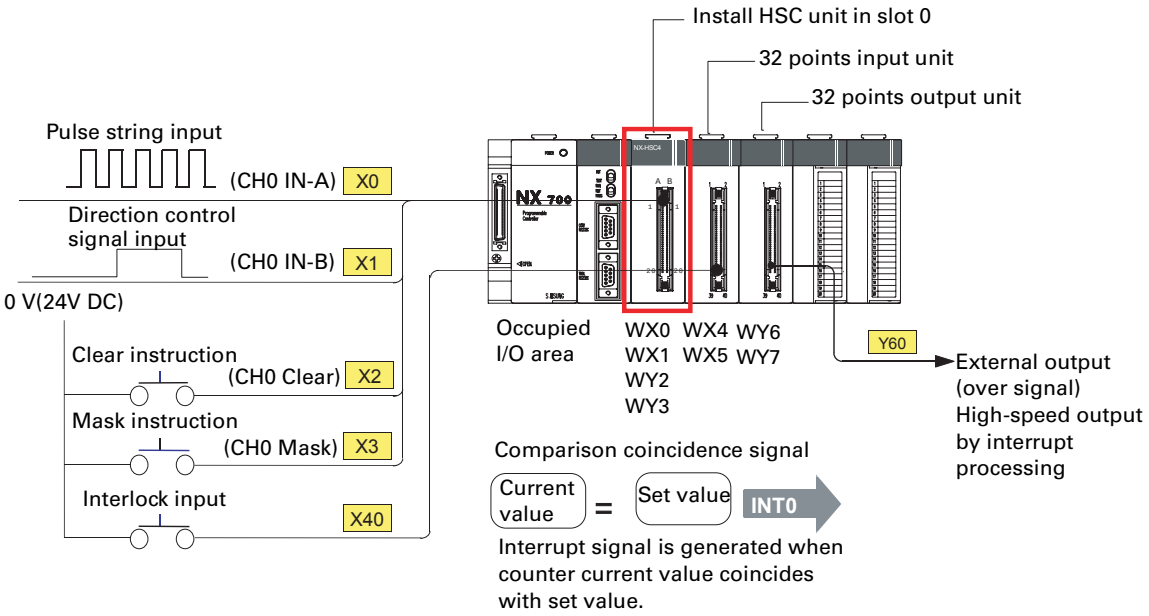
Describing programs to be run by interrupts following end instruction and permissions to interrupts before end instruction.

➡ This program is an example when the HSC unit is installed in slot 0.


R9013
[F1 DMV, HFFFFFFF2, DT100]
Preparing data input
Data setting for DT100 to DT101
[F151 WRT, K0, DT100, K2, H138]
Shared memory input
At the time of edge rising of external input at X8 (off →on), enter 「FFFFFFF2」 in 138h and 139h to generate interrupt.
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT101
to HSC shared memory 138h and 139h.
R9013
[ICTL, H0, H1]
INTO Interrupt generation permission
Y60
TMX 0, K5
Y60
< R >
Reset Y60
(ED)
(INT 0)
Interrupt program No.0
R9010
[F143 IORF, K4, K4]
Partial I/O refresh
X40
Y60
< S >
Set Y60
R9010
[F143 IORF, K6, K6]
Partial I/O refresh
(IRET)
End interrupt program No.0

Interrupt Functions (Comparison Coincidence Signal)

Overview

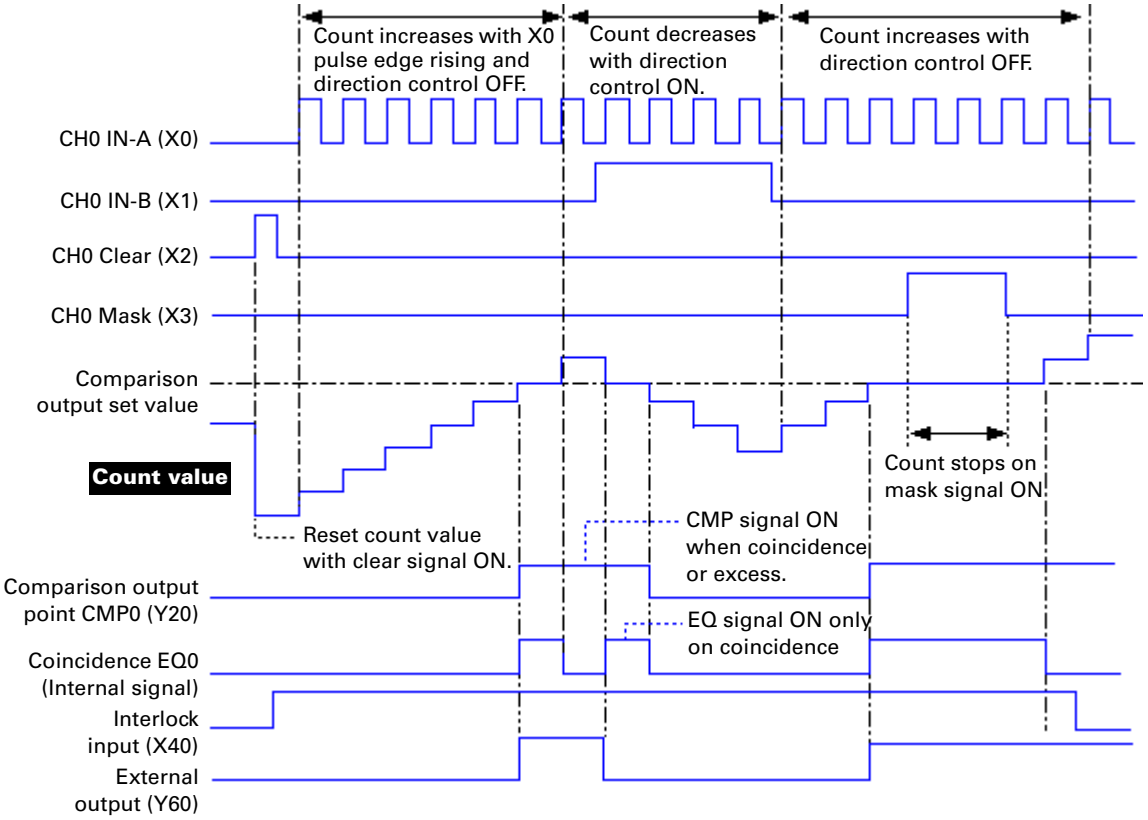


Input pulse string in X0 and direction control signal in X1 and measure the count number. If the counted pulse number reaches (exceeds) the pre-setted comparison output set value, interrupt is generated at INT0. When INT0 is generated, allocated programs from sequence program INT0 to IRET start, and Y60 output is sent out at a high speed.

NOTE For comparison functions, See *"Comparison Output Function" in Chapter 7*.

Time Chart

Count value and output change according to the input status of each signal as illustrated below.


Count increases with X0 pulse edge rising and direction control OFF.
Count decreases with direction control ON.
Count increases with direction control OFF.
CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Comparison output set value
Count value
Count stops on mask signal ON.
Reset count value with clear signal ON.
CMP signal ON when coincidence or excess.
Comparison output point CMP0 (Y20)
EQ signal ON only on coincidence
Coincidence EQ0 (Internal signal)
Interlock input (X40)
External output (Y60)

NOTE For signals such as clear and mask, See *"Setting Counter Function" in Chapter 6*.

Mode Setting Switch

In this example, set the switch to mode B where max. 8 interrupt points of INT0 to INT7 are available. If only one point is needed per unit set to mode C. But in mode C, signal will set to INT 16.

Mode B (SW1 →ON, SW2 →OFF)

Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, 8 interrupt points (INT0 to INT7) are automatically set regardless of ON/OFF setting of interrupt function.

Mode C (SW1 →OFF, SW2 →ON)

Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt settings.

*1: INT0 indicates the interrupt location on the unit. Interrupt program numbers INT 16 to 23 are available for sequence program setting.

Shared Memory Setting

Interrupt setting

When using interrupt function, shared memory setting is needed as well as setting of the mode setting switch on the bottom of the unit. In this example, comparison output function generates INT0 interrupt at CMP0. Enter「FFFFFFF1」in shared memory addresses 138h and 139h.

Shared Memory 138h, 139h Settings

(bit) 32					16 15			0
Counter number	INT7	INT6	INT5	INT4	INT3	INT2	INT1	INT0
Set value	F	F	F	F	F	F	F	1
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	CMP0

Counter Setting

Setting the operation mode for each counter CH.

In the example, pulse string is input to X0 and direction control signal to X1, and counter function is used in direction control mode. Enter「FFFFFF00」to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	X7	X6	X5	X4	X3	X2	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Used

Setting the comparison output set value

Setting the comparison output set value to be compared with counter current value.
In the example, the comparison result is output on CMP0 when counter current value is 6. Enter K6(H6) in shared memory addresses 120h, 121h.

Shared Memory 120h, 121h Settings

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	0	0	6
Settings	K6							

Setting the Comparison Output Point

Select the counter CH number to be used for comparison output function, and output logic.
In the example, counter current value at CH0 is compared with comparison output set value and the result is output. Therefore, enter 「FFFFFFF0」 in shared memory addresses 104h and 105h.

Shared Memory 104h, 105h Settings

(bit) 32					16 15			0
Comparison input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	F	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Comparision CMPO *

* CMPO is ON when current value ≥ set value

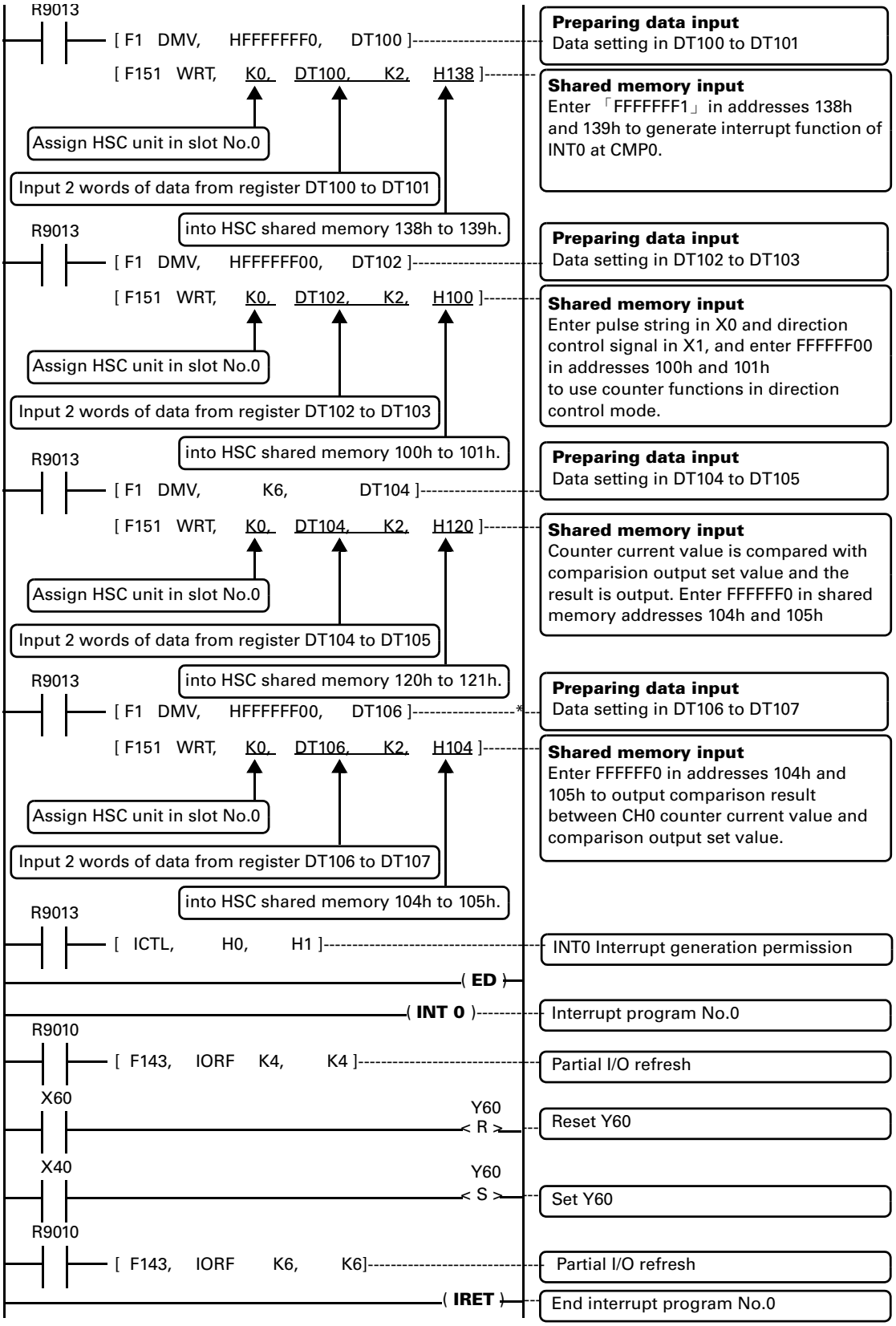
ATTENTION

When setting the comparison output function, make sure to first set shared memory for Comparison Output Set Value. Otherwise, coincidence output is generated at the time of data setting if the comparison output condition is met, as in the case that counter initial value and comparison output set value are both 0.

Sample Program

Setting interrupt settings and counter mode settings and comparison output functions in shared memory.
Describing programs to be run by interrupts following end instruction.

➡ This program is an example when the HSC unit is installed in slot 0.

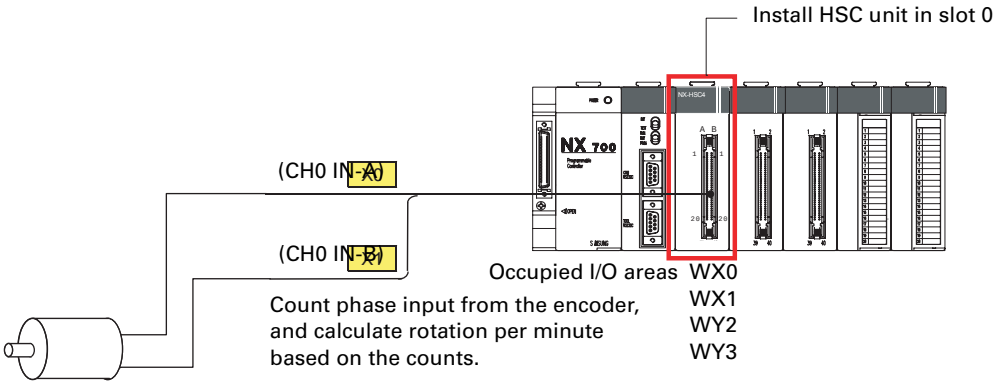

R9013
[F1 DMV, HFFFFFFF0, DT100]
[F151 WRT, K0, DT100, K2, H138]
Assign HSC unit in slot No.0
Input 2 words of data from register DT100 to DT101
into HSC shared memory 138h to 139h.
Preparing data input
Data setting in DT100 to DT101
Shared memory input
Enter 「FFFFFFF1」 in addresses 138h and 139h to generate interrupt function of INT0 at CMP0.
R9013
[F1 DMV, HFFFFFF00, DT102]
[F151 WRT, K0, DT102, K2, H100]
Assign HSC unit in slot No.0
Input 2 words of data from register DT102 to DT103
into HSC shared memory 100h to 101h.
Preparing data input
Data setting in DT102 to DT103
Shared memory input
Enter pulse string in X0 and direction control signal in X1, and enter FFFFFF00 in addresses 100h and 101h
to use counter functions in direction control mode.
R9013
[F1 DMV, K6, DT104]
[F151 WRT, K0, DT104, K2, H120]
Assign HSC unit in slot No.0
Input 2 words of data from register DT104 to DT105
into HSC shared memory 120h to 121h.
Preparing data input
Data setting in DT104 to DT105
Shared memory input
Counter current value is compared with comparision output set value and the result is output. Enter FFFFFF0 in shared memory addresses 104h and 105h
R9013
[F1 DMV, HFFFFFF00, DT106]*
[F151 WRT, K0, DT106, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT106 to DT107
into HSC shared memory 104h to 105h.
Preparing data input
Data setting in DT106 to DT107
Shared memory input
Enter FFFFFF0 in addresses 104h and 105h to output comparison result between CH0 counter current value and comparison output set value.
R9013
[ICTL, H0, H1]
INT0 Interrupt generation permission
(ED)
(INT 0)
Interrupt program No.0
R9010
[F143, IORF K4, K4]
Partial I/O refresh
X60
Y60
< R >
Reset Y60
X40
Y60
< S >
Set Y60
R9010
[F143, IORF K6, K6]
Partial I/O refresh
(IRET)
End interrupt program No.0

9

Sample Program

Speed Measuring

Overview

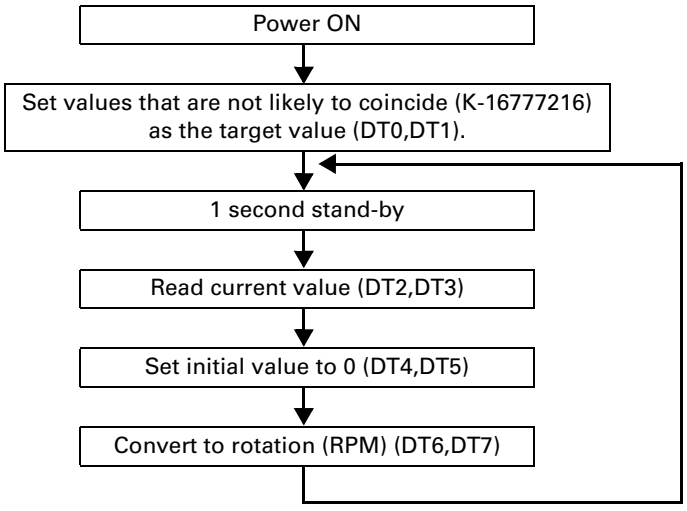


Formula for calculation of rotation per minute

$$\text{Rotation per minute} = \frac{\text{Pulse per second}}{\text{Pulse per rotation}} \times 60 = \frac{\text{Pulse per second} \times 60}{1000} = \text{Pulse per second} \times \frac{3}{50}$$

Enter phase signal from encoder in X0 and X1, and measure count numbers per second. Calculate rotation per minute.
In this example, the resolution of encoder is 1000 pulses/rotation.
Rotation per minute is stored in DT6 and DT7 for later checking with monitor functions of programming tools such as WinFPST S/W.

Flow Chart

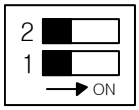

Power ON
Set values that are not likely to coincide (K-16777216) as the target value (DT0,DT1).
1 second stand-by
Read current value (DT2,DT3)
Set initial value to 0 (DT4,DT5)
Convert to rotation (RPM) (DT6,DT7)

IMPORTANT In phase differential input mode, the input pulse magnification can change with multiplication function. See *"Chapter 2"* for detail.

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.

In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, and therefore enter「FFFFFF20」to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal input

Counter Current Value Setting

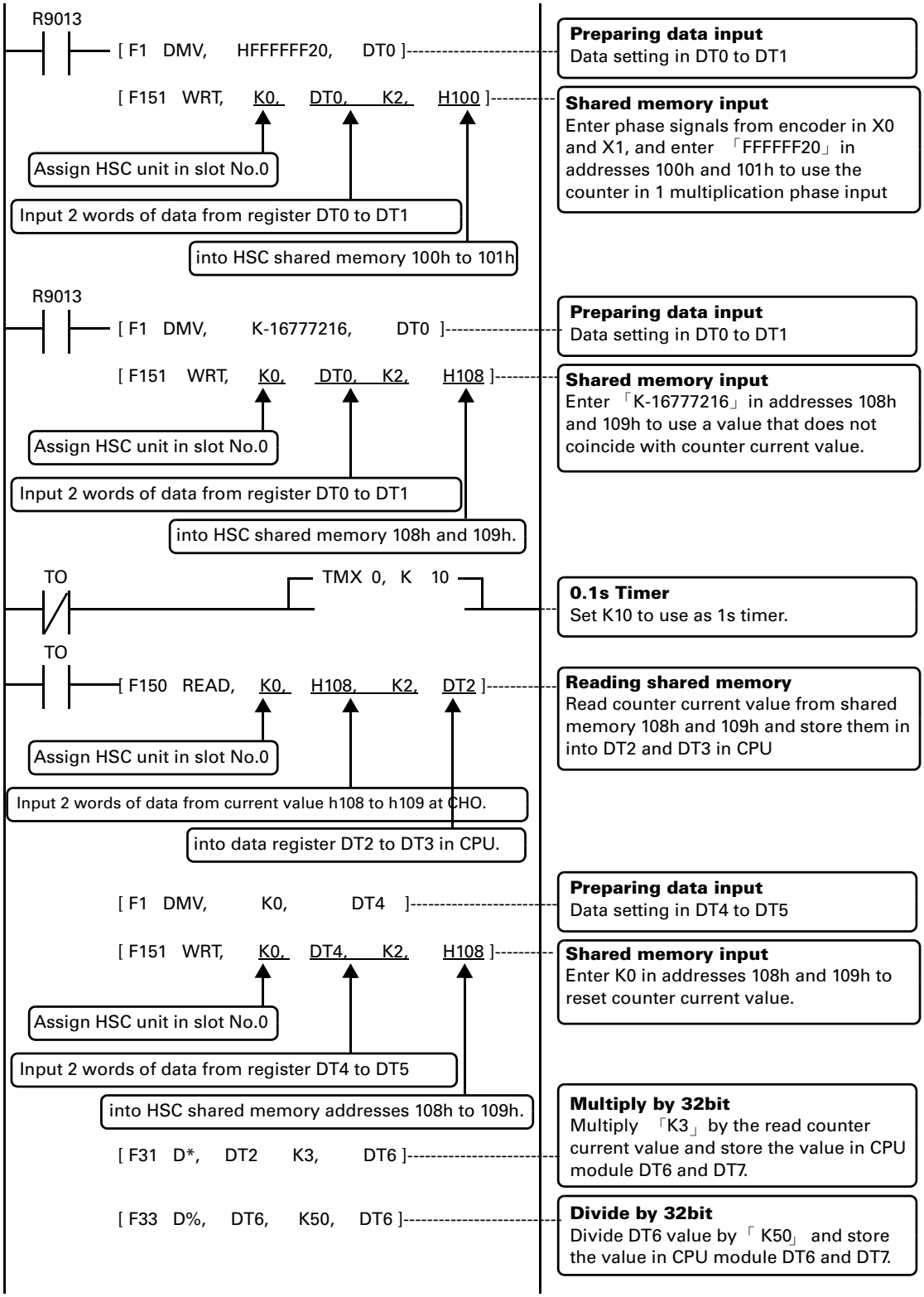
Enter a value that does not coincide with counter current value at CH0. In this example, enter「K-16777216(H FF000000)」in shared memory addresses 108h and 109h where the current value has been stored.

Shared Memory 108h, 109h Settings

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	0	0	0
Settings	K-16777216							

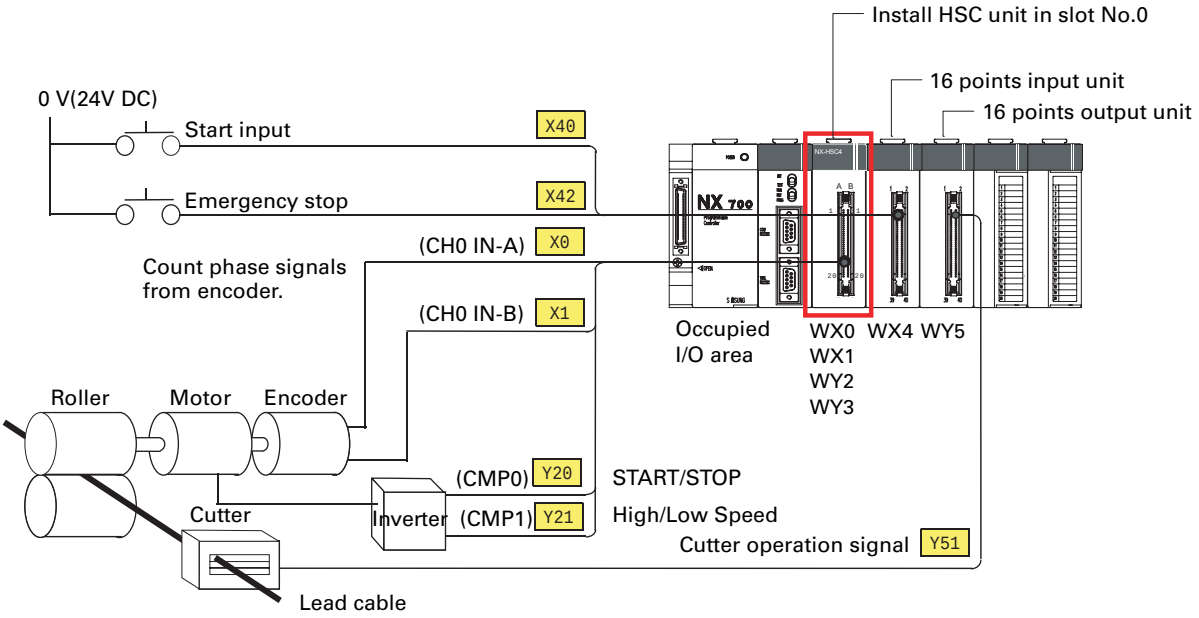
Sample Program

Enter「FFFFFF20」in counter setting areas (100h, 101h) of shared memory address, and the enter phase signal from encoder in X0 and X1, and calculate rotation per minute based on the values.


R9013
[F1 DMV, HFFFFFF20, DT0]
Preparing data input
Data setting in DT0 to DT1
[F151 WRT, K0, DT0, K2, H100]
Shared memory input
Enter phase signals from encoder in X0 and X1, and enter 「FFFFFF20」in addresses 100h and 101h to use the counter in 1 multiplication phase input
Assign HSC unit in slot No.0
Input 2 words of data from register DT0 to DT1
into HSC shared memory 100h to 101h
R9013
[F1 DMV, K-16777216, DT0]
Preparing data input
Data setting in DT0 to DT1
[F151 WRT, K0, DT0, K2, H108]
Shared memory input
Enter 「K-16777216」in addresses 108h and 109h to use a value that does not coincide with counter current value.
Assign HSC unit in slot No.0
Input 2 words of data from register DT0 to DT1
into HSC shared memory 108h and 109h.
TO
TMX 0, K 10
0.1s Timer
Set K10 to use as 1s timer.
TO
[F150 READ, K0, H108, K2, DT2]
Reading shared memory
Read counter current value from shared memory 108h and 109h and store them in into DT2 and DT3 in CPU
Assign HSC unit in slot No.0
Input 2 words of data from current value h108 to h109 at CHO.
into data register DT2 to DT3 in CPU.
[F1 DMV, K0, DT4]
Preparing data input
Data setting in DT4 to DT5
[F151 WRT, K0, DT4, K2, H108]
Shared memory input
Enter K0 in addresses 108h and 109h to reset counter current value.
Assign HSC unit in slot No.0
Input 2 words of data from register DT4 to DT5
into HSC shared memory addresses 108h to 109h.
[F31 D*, DT2 K3, DT6]
Multiply by 32bit
Multiply 「K3」by the read counter current value and store the value in CPU module DT6 and DT7.
[F33 D%, DT6, K50, DT6]
Divide by 32bit
Divide DT6 value by 「K50」and store the value in CPU module DT6 and DT7.

Fixed length Processing

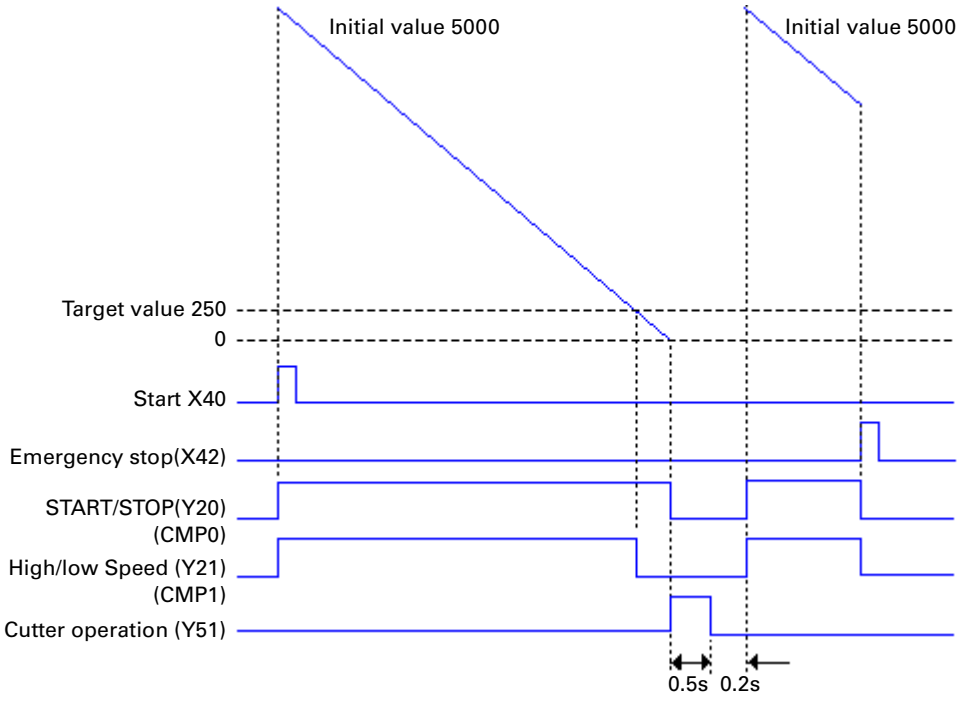
Overview



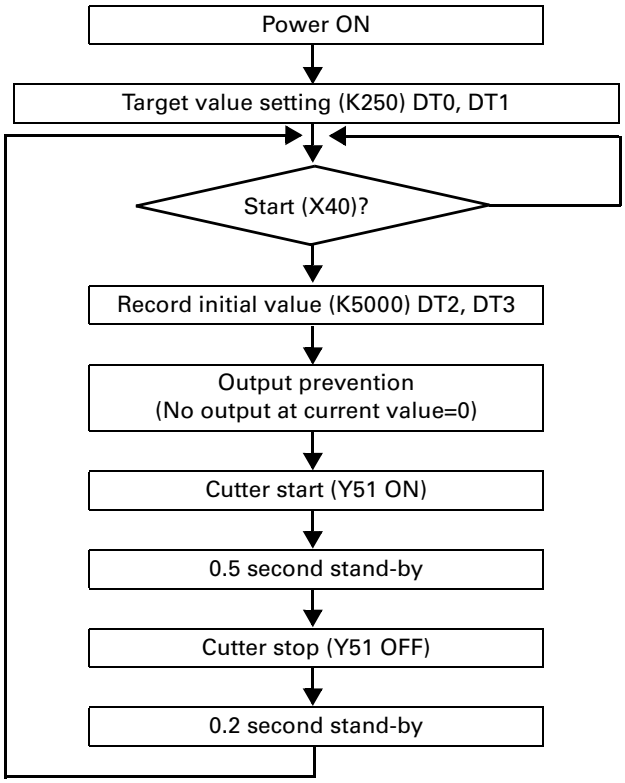
In the example, a transfer roller with diameter of 10cm and 10cm movement of lead cable by one rotation is used.
With this roller, slow the rotation when lead cable moves 95cm, and stop rotation at 100cm(10 rotations).
In this example, the resolution of encoder is 500 pulses/rotation. Also, pulse output is not used, and inverter start/stop is controlled by CMP0 signal, and high/low speed is controlled by CMP1 signal.

Time Chart

Count value and output change according to the input status of each signal as illustrated below.



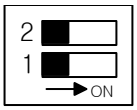
Flow Chart



Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No Interrupt function

- Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

IMPORTANT In phase differential input mode, the input pulse magnification can change with multiplication function. See *"Parts and Functions" in Chapter 2*.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.
In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, and therefore enter「FFFFFF20」to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32				16 15				0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal input

Counter Current Value Setting

Enter「K5000 (H1388)」as count initial value in the shared memory addresses 108h and 109h where the counter current value of CH0 is stored.

Shared Memory 108h, 109h Settings

(bit) 32				16 15				0
Setting item	Comparison output set value (for CMP0)							
Set value	F	F	0	0	1	3	8	8
Settings	K 5000							

Setting the Comparison Output Set Value

Setting the Comparison output set value to be compared with Counter current value.
In the example, enter「K0 (H0)」in shared memory addresses 120h, 121h and「K250 (H FA)」in 122h, 123h, to output CMP0 when counter current value is 0 and CMP1 when 250.

Shared memory 120h, 121h settings

(bit) 32				16 15				0
Setting item	Comparison output set value (for CMP0)							
Set value	0	0	0	0	0	0	0	0
Settings	K0							

Shared Memory 122h, 123h Settings

(bit) 32				16 15				0
Setting item	Comparison output set value (for CMP2)							
Set value	0	0	0	0	0	0	F	A
Settings	K250							

Setting the Comparison Output Set Value

Select the counter CH number to be used for comparison output function, and output logic.
In the example, counter current value at CH0 is compared with comparison output set value and the result is output as CMP0 and CMP1. Therefore, enter「FFFFFF44」or「FFFFFF00」in shared memory addresses 104h and 105h.

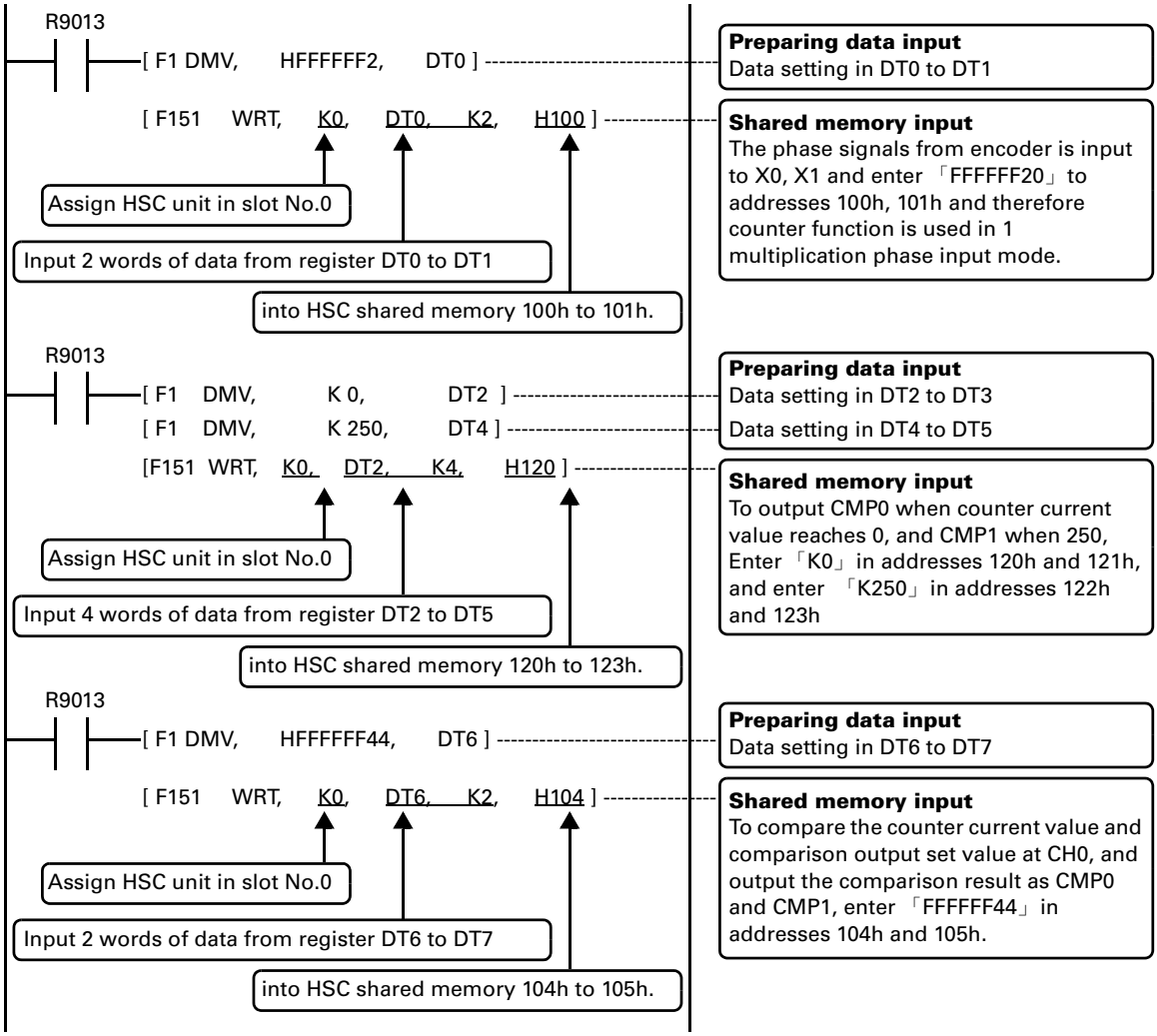
Shared memory 104h, 105h settings

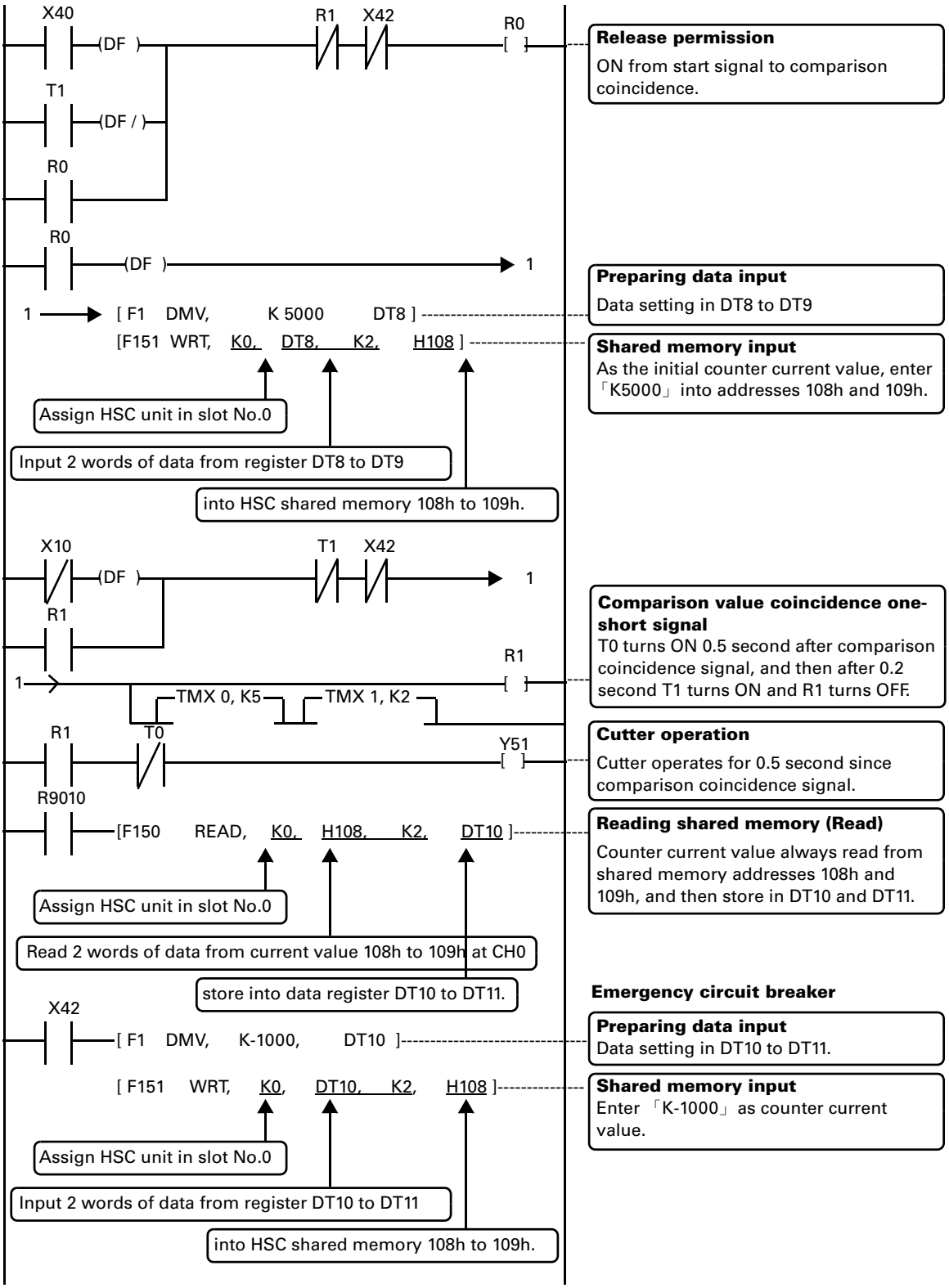
(bit) 32				16 15			0
Comparison Input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	4	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	CH0 * Comparison	CH0 * Comparison

* CMPO is ON when current value ≥ set value

Sample Program

In this example, counter and comparison function settings in shared memory will be made, and button operation program will be started.


R9013
[F1 DMV, HFFFFFF2, DT0]
[F151 WRT, K0, DT0, K2, H100]
Assign HSC unit in slot No.0
Input 2 words of data from register DT0 to DT1
into HSC shared memory 100h to 101h.
Preparing data input
Data setting in DT0 to DT1
Shared memory input
The phase signals from encoder is input to X0, X1 and enter 「FFFFFF20」to addresses 100h, 101h and therefore counter function is used in 1 multiplication phase input mode.
R9013
[F1 DMV, K 0, DT2]
[F1 DMV, K 250, DT4]
[F151 WRT, K0, DT2, K4, H120]
Assign HSC unit in slot No.0
Input 4 words of data from register DT2 to DT5
into HSC shared memory 120h to 123h.
Preparing data input
Data setting in DT2 to DT3
Data setting in DT4 to DT5
Shared memory input
To output CMP0 when counter current value reaches 0, and CMP1 when 250, Enter 「K0」in addresses 120h and 121h, and enter 「K250」in addresses 122h and 123h
R9013
[F1 DMV, HFFFFFF44, DT6]
[F151 WRT, K0, DT6, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT6 to DT7
into HSC shared memory 104h to 105h.
Preparing data input
Data setting in DT6 to DT7
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF44」in addresses 104h and 105h.

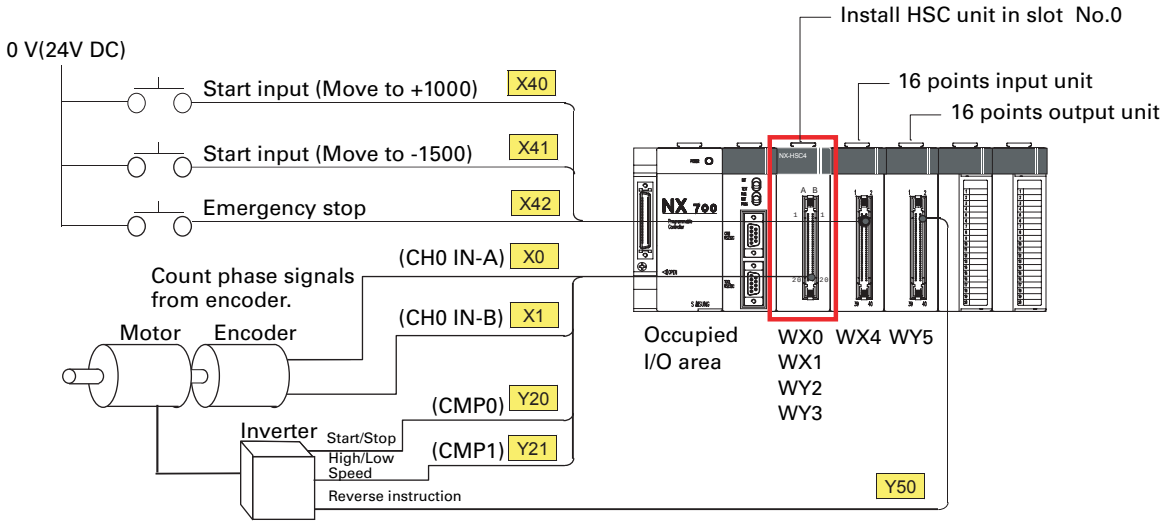

X40
(DF)
R1
X42
R0
[ ]
Release permission
ON from start signal to comparison coincidence.
T1
(DF /)
R0
R0
(DF)
1
1
[F1 DMV, K 5000 DT8]
Preparing data input
Data setting in DT8 to DT9
[F151 WRT, K0, DT8, K2, H108]
Shared memory input
As the initial counter current value, enter 「K5000」 into addresses 108h and 109h.
Assign HSC unit in slot No.0
Input 2 words of data from register DT8 to DT9
into HSC shared memory 108h to 109h.
X10
(DF)
T1
X42
1
R1
1
R1
[ ]
TMX 0, K5
TMX 1, K2
Comparison value coincidence one-short signal
T0 turns ON 0.5 second after comparison coincidence signal, and then after 0.2 second T1 turns ON and R1 turns OFF.
R1
T0
Y51
[ ]
Cutter operation
Cutter operates for 0.5 second since comparison coincidence signal.
R9010
[F150 READ, K0, H108, K2, DT10]
Reading shared memory (Read)
Counter current value always read from shared memory addresses 108h and 109h, and then store in DT10 and DT11.
Assign HSC unit in slot No.0
Read 2 words of data from current value 108h to 109h at CH0
store into data register DT10 to DT11.
Emergency circuit breaker
X42
[F1 DMV, K-1000, DT10]
Preparing data input
Data setting in DT10 to DT11.
[F151 WRT, K0, DT10, K2, H108]
Shared memory input
Enter 「K-1000」 as counter current value.
Assign HSC unit in slot No.0
Input 2 words of data from register DT10 to DT11
into HSC shared memory 108h to 109h.

Stored Value in Data Register

Address	Event
DT2 to DT4	Target value
DT8 to DT9	Initial value
DT10 to DT11	Current value

Location Control by Absolute Value

Overview

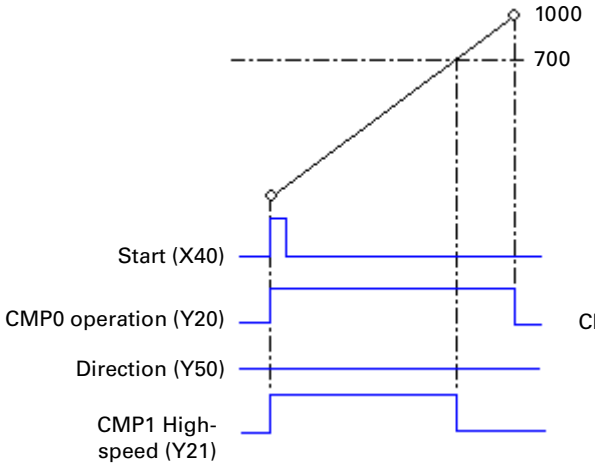


Location is controlled by absolute value. In this example, location changes to +1000 at X40 input and -1500 at X41 input, and then speed decreases before 300 pulses at the stop point, and finally everything stops. Also, pulse output is not used, and inverter start/stop is controlled by CMP0 signal, and high/low speed is controlled by CMP1 signal.

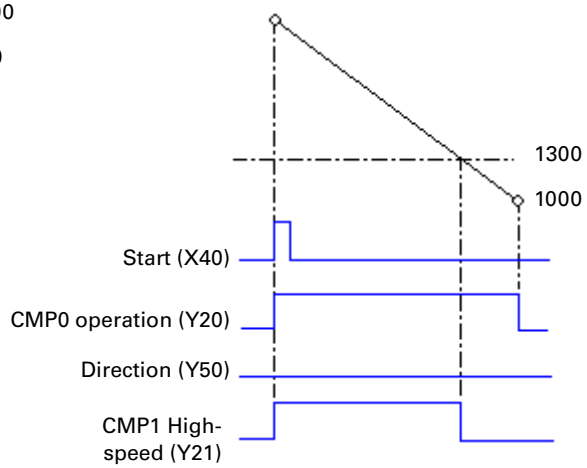
Time Chart

Count value and output change according to the input status of each signal as illustrated below.

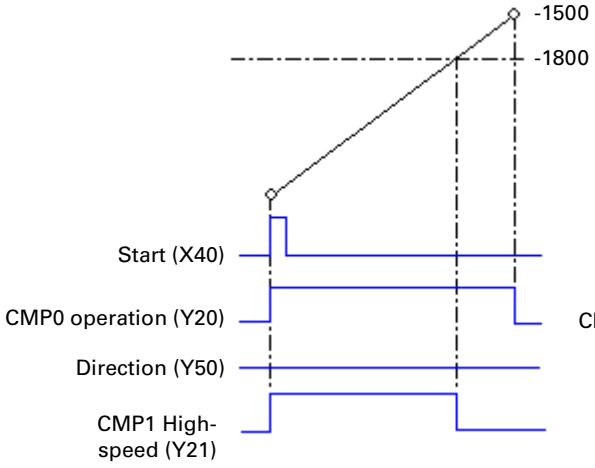
X40 ON Target value K1000
(Current value < Target value)



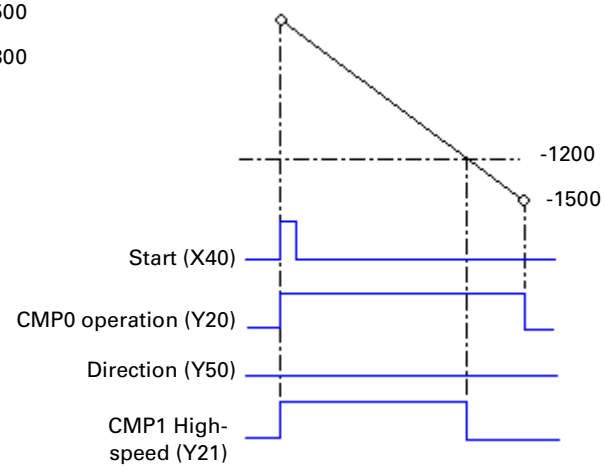
X40 ON Target value K1000
(Current value > Target value)



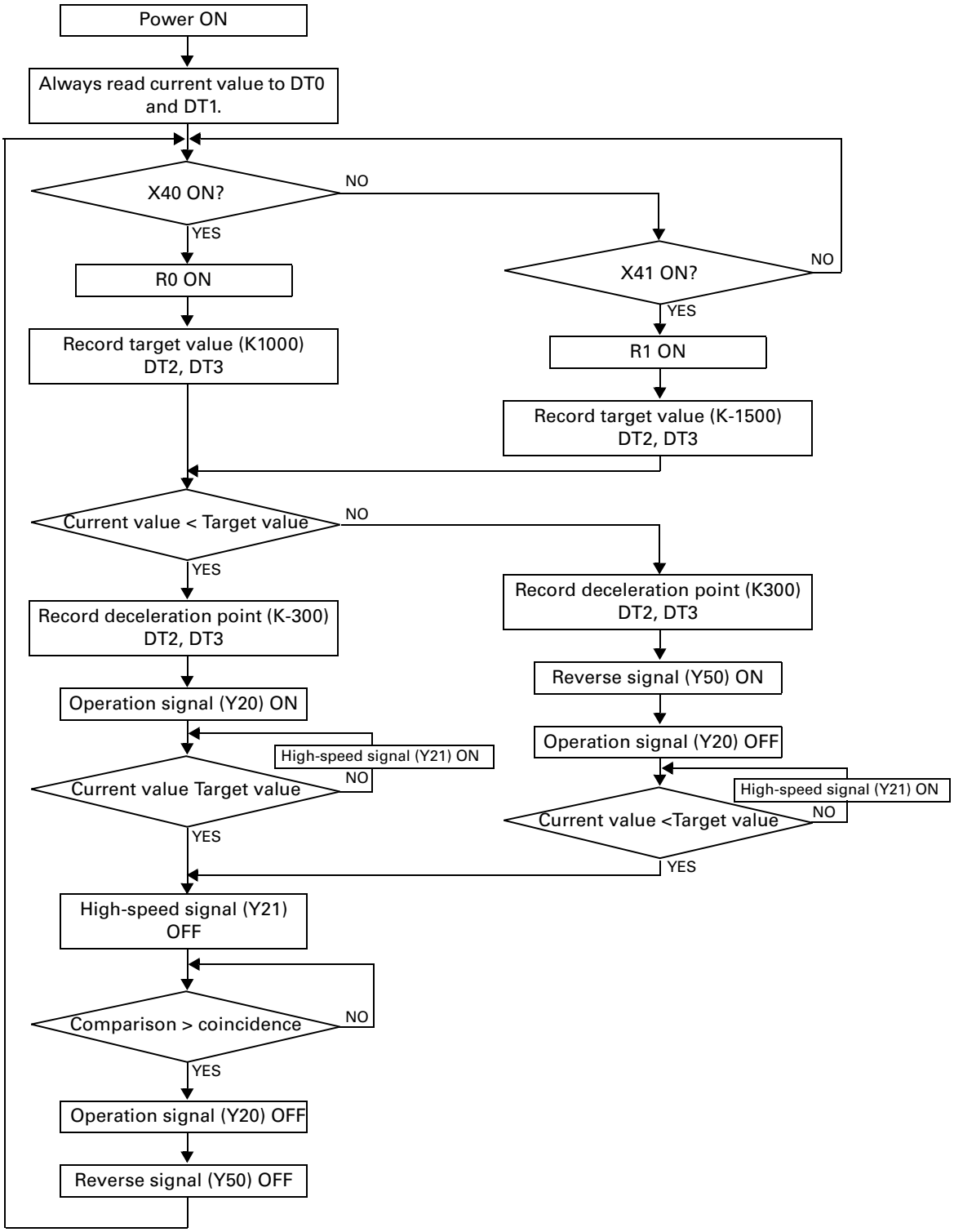
X41 ON Target value K-1500
(Current value < Target value)



X41 ON Target value K-1500
(Current value > Target value)



Flow Chart



IMPORTANT In phase differential input mode, the input pulse magnification can change with multiplication function.

See *"Chapter 2"* for details.

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)

No interrupt function

- Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (OM/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.

In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, and therefore enter「FFFFFF20」 to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal Input

Setting the Comparison Output Set Value

Setting the Comparison output set value to be compared with Counter current value.

In this example, enter「K1000 (H 3E8)」 into shared memory addresses 120h and 121h when X40 turns ON, and 「K-1500 (H FFFFFA24)」 into 120h and 121h when X41 ON.

Shared Memory 120h, 121h Settings (X40 ON)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	0	0	0	0	0	3	E	8
Settings	K 1000							

Shared Memory 120h, 121h Settings (X41 ON)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	F	F	F	F	F	A	2	4
Settings	K-1500							

Setting the Comparison Output Point

Select the counter CH number to be used for comparison output function, and output logic.

In the example, counter current value at CH0 is compared with comparison output set value, and the result is output at CMP0 and CMP1. Therefore, enter 「FFFFFF44」 or 「FFFFFF00」 in shared memory addresses 104h and 105h.

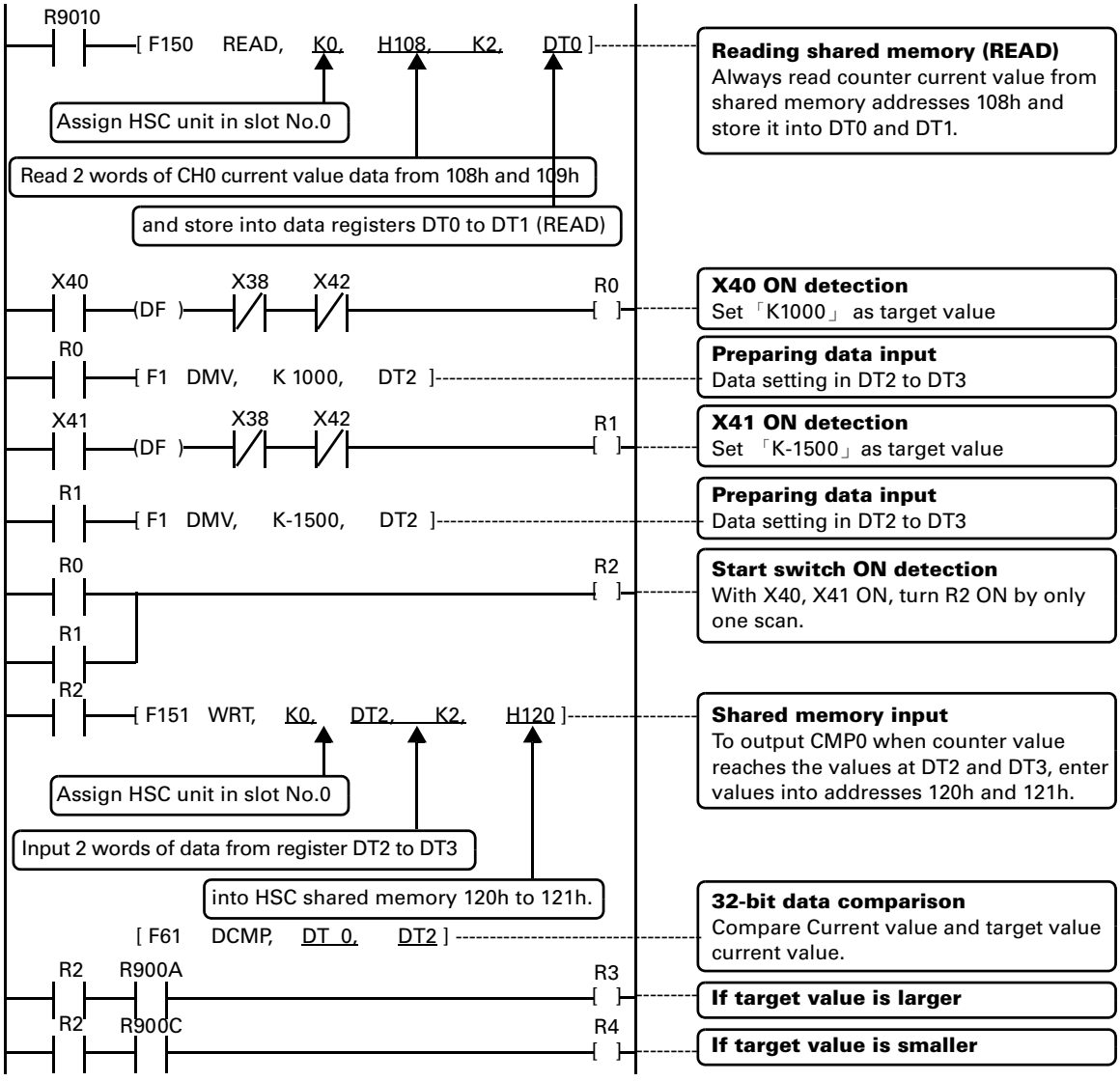
Shared Memory 104h, 105h Settings

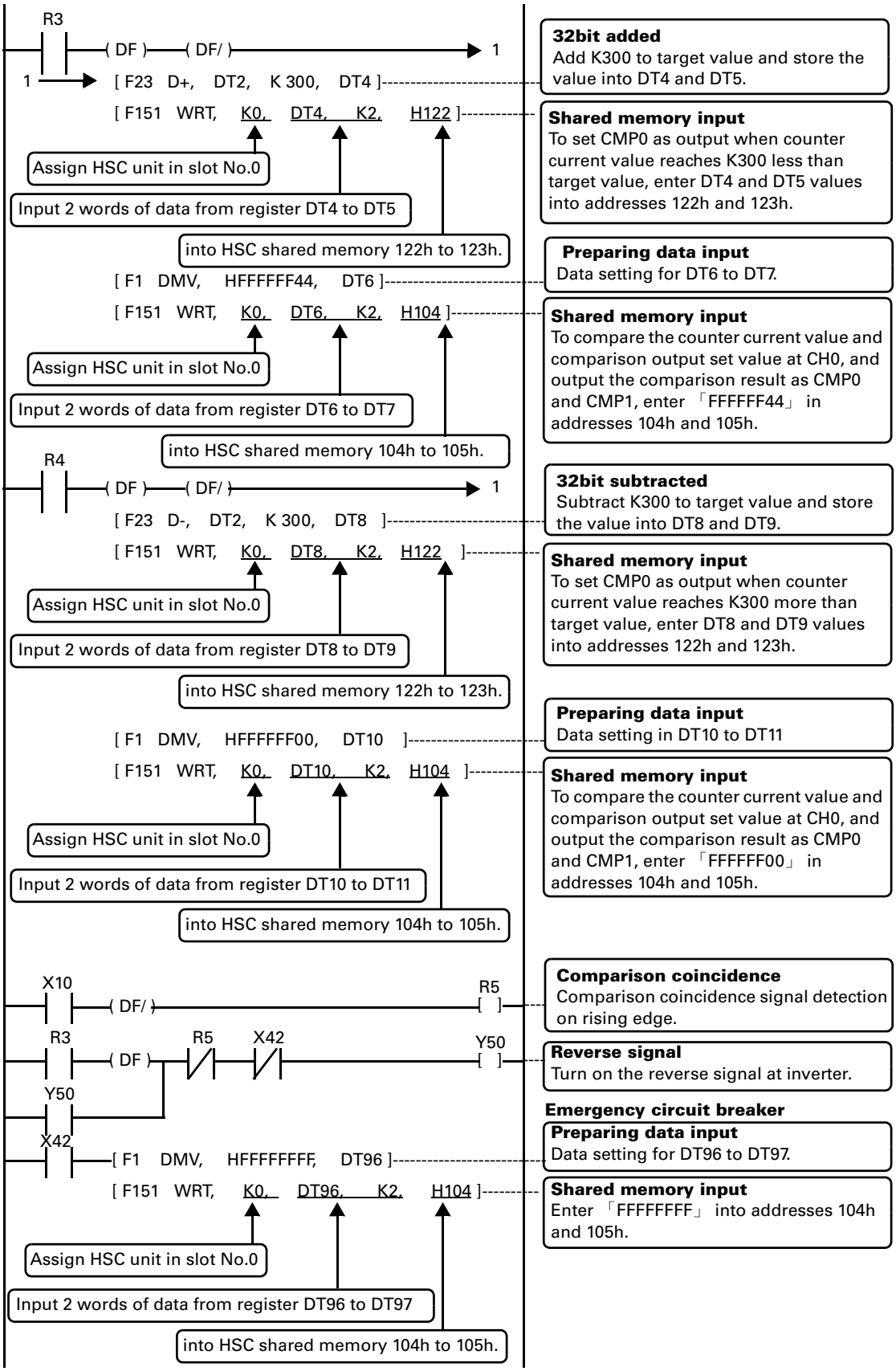
(bit) 32				16 15			0
Comparison input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	4	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	CH0 * Comparison	CH0 * Comparison

* CMPO is ON when current value ≥ set value

Sample Program

In this example, counter and comparison function settings in shared memory will be made, and button operation program will be started.


R9010
[F150 READ, K0, H108, K2, DT0]
Assign HSC unit in slot No.0
Read 2 words of CH0 current value data from 108h and 109h
and store into data registers DT0 to DT1 (READ)
Reading shared memory (READ)
Always read counter current value from shared memory addresses 108h and store it into DT0 and DT1.
X40 (DF) X38 X42 R0
X40 ON detection
Set 「K1000」 as target value
R0 [F1 DMV, K 1000, DT2]
Preparing data input
Data setting in DT2 to DT3
X41 (DF) X38 X42 R1
X41 ON detection
Set 「K-1500」 as target value
R1 [F1 DMV, K-1500, DT2]
Preparing data input
Data setting in DT2 to DT3
R0 R1 R2
Start switch ON detection
With X40, X41 ON, turn R2 ON by only one scan.
R2 [F151 WRT, K0, DT2, K2, H120]
Assign HSC unit in slot No.0
Input 2 words of data from register DT2 to DT3
into HSC shared memory 120h to 121h.
Shared memory input
To output CMP0 when counter value reaches the values at DT2 and DT3, enter values into addresses 120h and 121h.
[F61 DCMP, DT 0, DT2]
32-bit data comparison
Compare Current value and target value current value.
R2 R900A R3
If target value is larger
R2 R900C R4
If target value is smaller

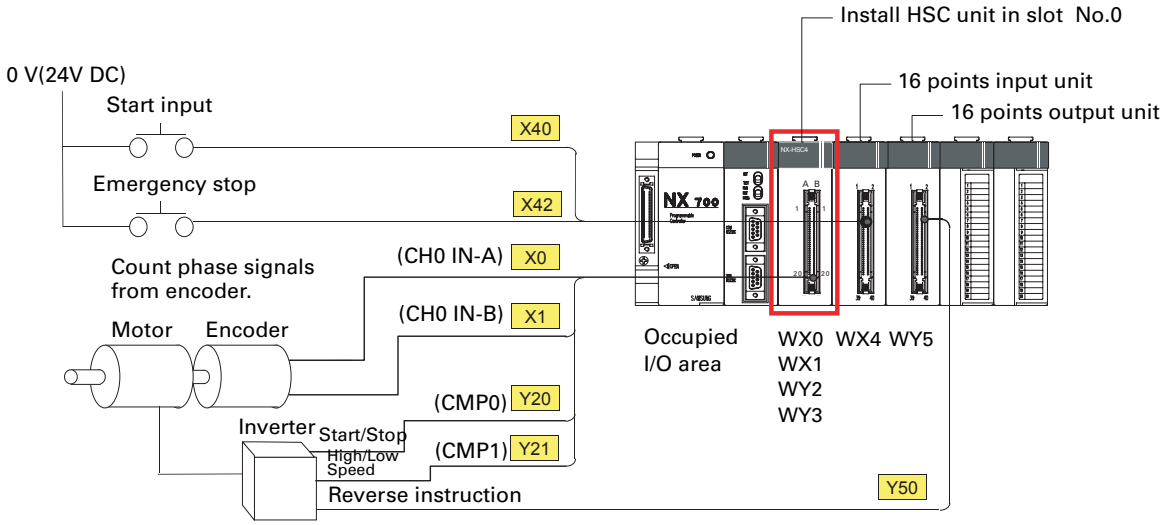

R3
(DF) (DF/)
1
1
[F23 D+, DT2, K 300, DT4]
[F151 WRT, K0, DT4, K2, H122]
Assign HSC unit in slot No.0
Input 2 words of data from register DT4 to DT5
into HSC shared memory 122h to 123h.
[F1 DMV, HFFFFFF44, DT6]
[F151 WRT, K0, DT6, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT6 to DT7
into HSC shared memory 104h to 105h.
R4
(DF) (DF/)
1
[F23 D-, DT2, K 300, DT8]
[F151 WRT, K0, DT8, K2, H122]
Assign HSC unit in slot No.0
Input 2 words of data from register DT8 to DT9
into HSC shared memory 122h to 123h.
[F1 DMV, HFFFFFF00, DT10]
[F151 WRT, K0, DT10, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT10 to DT11
into HSC shared memory 104h to 105h.
X10
(DF/)
R5
[ ]
R3
(DF)
R5
X42
Y50
[ ]
Y50
X42
[F1 DMV, HFFFFFFFF, DT96]
[F151 WRT, K0, DT96, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT96 to DT97
into HSC shared memory 104h to 105h.
32bit added
Add K300 to target value and store the value into DT4 and DT5.
Shared memory input
To set CMP0 as output when counter current value reaches K300 less than target value, enter DT4 and DT5 values into addresses 122h and 123h.
Preparing data input
Data setting for DT6 to DT7.
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF44」 in addresses 104h and 105h.
32bit subtracted
Subtract K300 to target value and store the value into DT8 and DT9.
Shared memory input
To set CMP0 as output when counter current value reaches K300 more than target value, enter DT8 and DT9 values into addresses 122h and 123h.
Preparing data input
Data setting in DT10 to DT11
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF00」 in addresses 104h and 105h.
Comparison coincidence
Comparison coincidence signal detection on rising edge.
Reverse signal
Turn on the reverse signal at inverter.
Emergency circuit breaker
Preparing data input
Data setting for DT96 to DT97.
Shared memory input
Enter 「FFFFFFFF」 into addresses 104h and 105h.

Stored value in data register

Address	Event
DT0, DT1	Current value
DT2, DT3	Target value
DT4, DT5	Deceleration point
DT8, DT9	Deceleration point

Location Control by Data Table

Overview



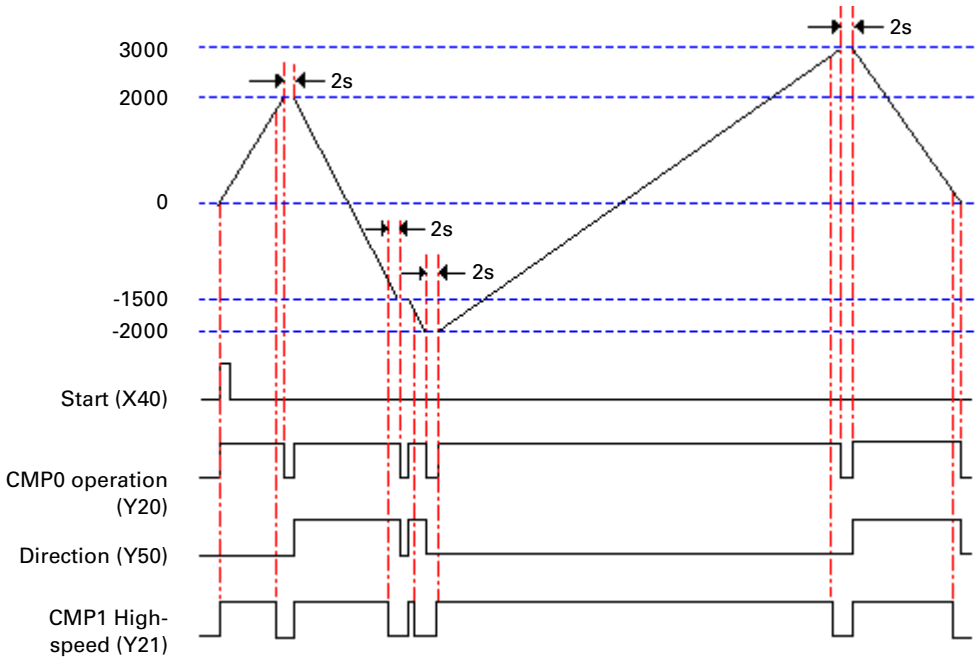
In the example, location is controlled as absolute values according to the set values in data table.
Speed decreases before 300 pulses at the stop point, and finally all stop. Data table is organized as follows, and deceleration point value (relative pulse value) is also registered.

Address	Set value	Event
DT10, DT11	K 300	Speed turning point
DT12, DT13	K 2000	Target value 1
DT14, DT15	K -1500	Target value 2
DT16, DT17	K -2000	Target value 3
DT18, DT19	K 3000	Target value 4
DT20, DT21	K 0	Target value 5

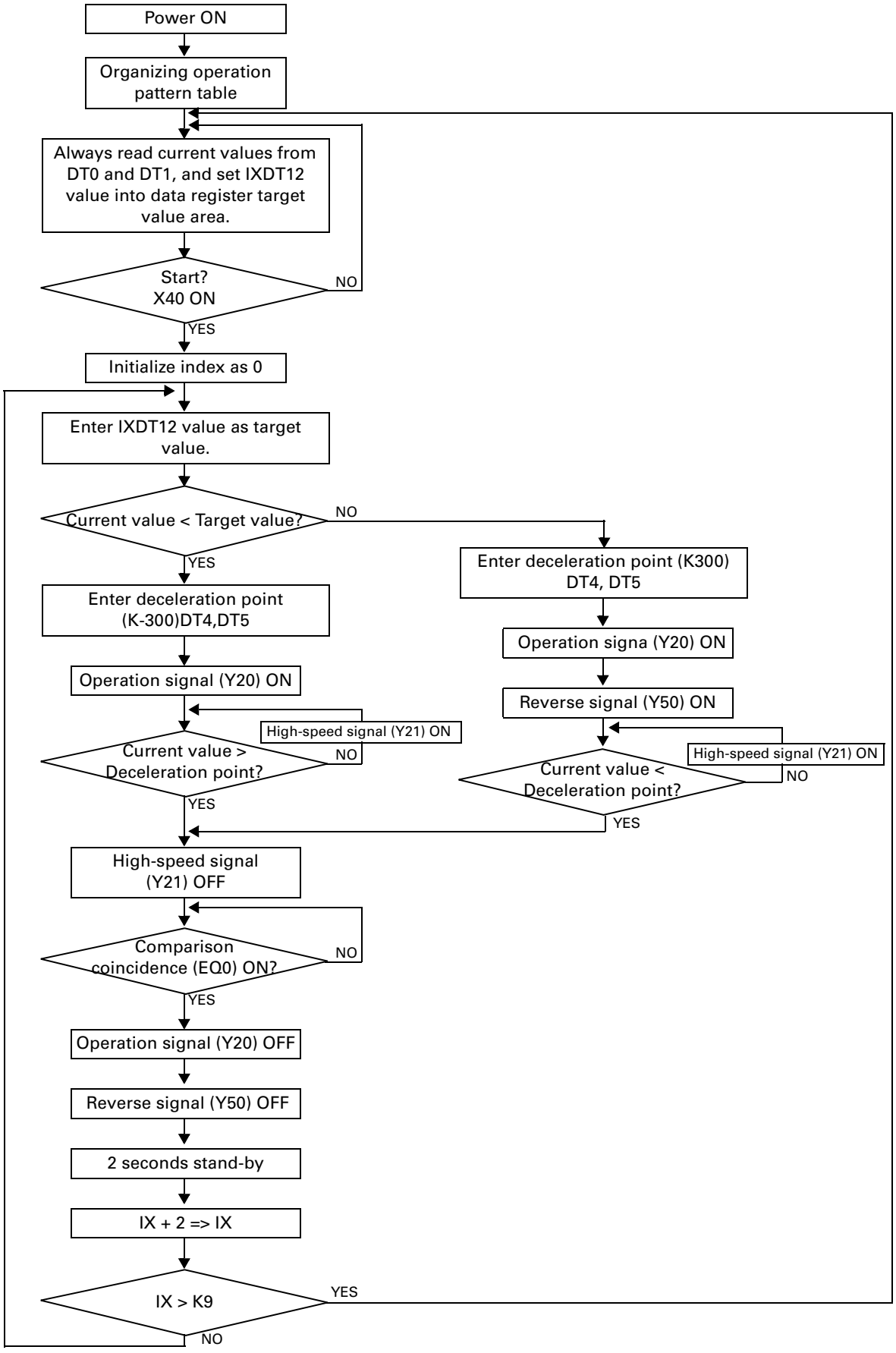
Also, pulse output is not used, and inverter start/stop is controlled by CMP0 signal, and high/low speed is controlled by CMP1 signal.

Time Chart

Count value and output change according to the input status of each signal as illustrated below.
Deceleration starts K300 pulses prior to each target value.



Flow Chart


Power ON
Organizing operation pattern table
Always read current values from DT0 and DT1, and set IXDT12 value into data register target value area.
Start? X40 ON
NO
YES
Initialize index as 0
Enter IXDT12 value as target value.
Current value < Target value?
NO
YES
Enter deceleration point (K-300)DT4,DT5
Operation signal (Y20) ON
High-speed signal (Y21) ON
Current value > Deceleration point?
NO
YES
Enter deceleration point (K300) DT4, DT5
Operation signa (Y20) ON
Reverse signal (Y50) ON
High-speed signal (Y21) ON
Current value < Deceleration point?
NO
YES
High-speed signal (Y21) OFF
Comparison coincidence (EQ0) ON?
NO
YES
Operation signal (Y20) OFF
Reverse signal (Y50) OFF
2 seconds stand-by
IX + 2 => IX
IX > K9
YES
NO

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)

No interrupt function

- Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (used or unused) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.
In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, and therefore enter「FFFFFF20」to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal input

Setting the Comparison Output Set Value

Setting the operation mode for each counter CH.
In the example,「K2000(H 7D0)」,「K-1500(H FFFFFA24)」,「K-2000(H FFFFF830)」,「K3000(H BB8)」,「K0(H 0)」is input to shared memory addresses 120h and 121h in sequential order.

Shared Memory 120h, 121h Settings (Target Value 1)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	0	0	0	0	0	7	D	0
Settings	K 2000							

Shared Memory 120h, 121h Settings (Target Value 2)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP1)							
Set value	F	F	F	F	F	A	2	4
Settings	K-1500							

Shared Memory 120h, 121h Settings (Target Value 3)

(bit) 32	16	15	0
Setting item	Comparison output set value (for CMP0)		
Set value	F F F F F 8 3 0		
Settings	K -2000		

Shared Memory 120h, 121h Settings (Target Value 4)

(bit) 32	16	15	0
Setting item	Comparison output set value (for CMP0)		
Set value	0 0 0 0 0 B B 8		
Settings	K 3000		

Shared Memory 120h, 121h Settings (Target Value 5)

(bit) 32	16	15	0
Setting item	Comparison output set value (for CMP0)		
Set value	0 0 0 0 0 0 0 0		
Settings	K 0		

Setting the Comparison Output Point

Select the counter CH number to be used for comparison output function, and output logic.
In the example, counter current value at CH0 is compared with comparison output set value, and the result is output at CMP0 and CMP1. Therefore, enter「FFFFFF44」or「FFFFFF00」in shared memory addresses 104h and 105h.

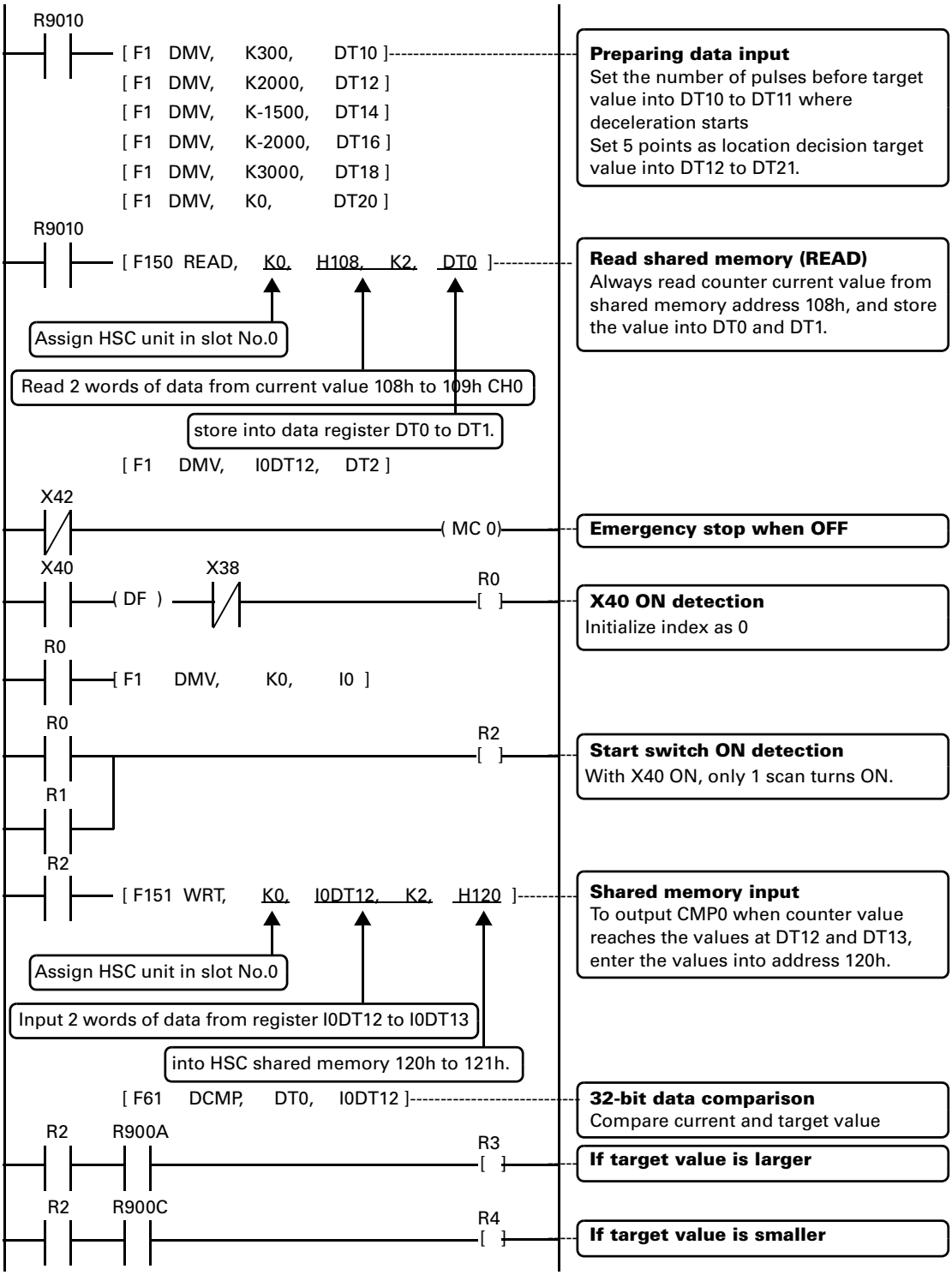
Shared Memory 104h, 105h Settings

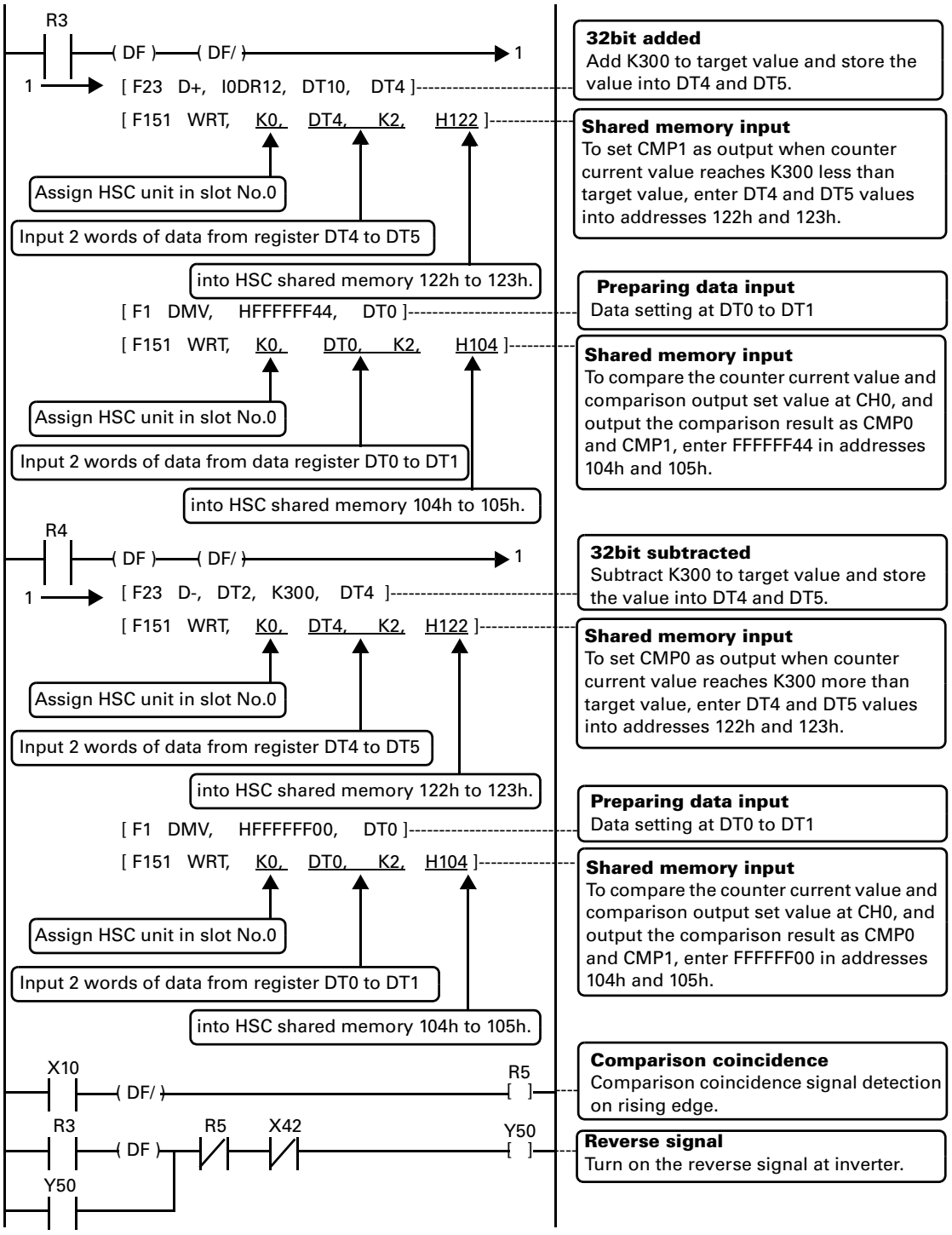
(bit) 32	16	15	0
Comparison input	CMP7 CMP6 CMP5 CMP4 CMP3 CMP2 CMP1 CMP0		
Set value	F F F F F F 4 4		
Settings	Unused Unused Unused Unused Unused Unused CH0 * Comparison	CH0 * Comparison	

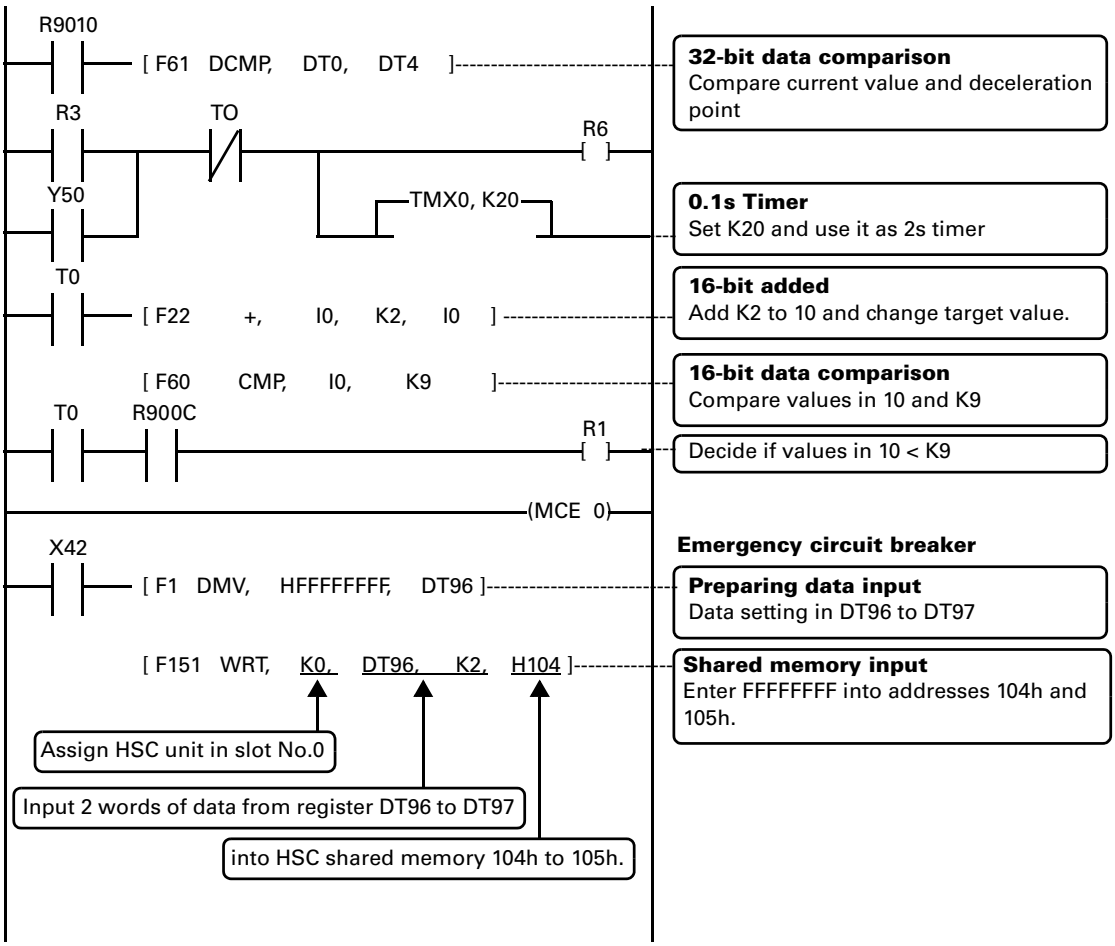
* CMPO is ON when current value ≥ set value

Sample Program

In this example, counter and comparison function settings in shared memory will be made, and button operation program will be started.


R9010
[F1 DMV, K300, DT10]
[F1 DMV, K2000, DT12]
[F1 DMV, K-1500, DT14]
[F1 DMV, K-2000, DT16]
[F1 DMV, K3000, DT18]
[F1 DMV, K0, DT20]
Preparing data input
Set the number of pulses before target value into DT10 to DT11 where deceleration starts
Set 5 points as location decision target value into DT12 to DT21.
R9010
[F150 READ, K0, H108, K2, DT0]
Read shared memory (READ)
Always read counter current value from shared memory address 108h, and store the value into DT0 and DT1.
Assign HSC unit in slot No.0
Read 2 words of data from current value 108h to 109h CH0
store into data register DT0 to DT1.
[F1 DMV, I0DT12, DT2]
X42
(MC 0)
Emergency stop when OFF
X40
(DF)
X38
R0
[ ]
X40 ON detection
Initialize index as 0
R0
[F1 DMV, K0, I0]
R0
R2
[ ]
Start switch ON detection
With X40 ON, only 1 scan turns ON.
R1
R2
[F151 WRT, K0, I0DT12, K2, H120]
Shared memory input
To output CMP0 when counter value reaches the values at DT12 and DT13, enter the values into address 120h.
Assign HSC unit in slot No.0
Input 2 words of data from register I0DT12 to I0DT13
into HSC shared memory 120h to 121h.
[F61 DCMP, DT0, I0DT12]
32-bit data comparison
Compare current and target value
R2
R900A
R3
[ ]
If target value is larger
R2
R900C
R4
[ ]
If target value is smaller


R3
DF
DF/
1
[F23 D+, I0DR12, DT10, DT4]
[F151 WRT, K0, DT4, K2, H122]
Assign HSC unit in slot No.0
Input 2 words of data from register DT4 to DT5
into HSC shared memory 122h to 123h.
[F1 DMV, HFFFFFF44, DT0]
[F151 WRT, K0, DT0, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from data register DT0 to DT1
into HSC shared memory 104h to 105h.
R4
[F23 D-, DT2, K300, DT4]
[F151 WRT, K0, DT4, K2, H122]
Assign HSC unit in slot No.0
Input 2 words of data from register DT4 to DT5
into HSC shared memory 122h to 123h.
[F1 DMV, HFFFFFF00, DT0]
[F151 WRT, K0, DT0, K2, H104]
Assign HSC unit in slot No.0
Input 2 words of data from register DT0 to DT1
into HSC shared memory 104h to 105h.
X10
R5
R3
X42
Y50
Y50
32bit added
Add K300 to target value and store the value into DT4 and DT5.
Shared memory input
To set CMP1 as output when counter current value reaches K300 less than target value, enter DT4 and DT5 values into addresses 122h and 123h.
Preparing data input
Data setting at DT0 to DT1
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter FFFFFF44 in addresses 104h and 105h.
32bit subtracted
Subtract K300 to target value and store the value into DT4 and DT5.
Shared memory input
To set CMP0 as output when counter current value reaches K300 more than target value, enter DT4 and DT5 values into addresses 122h and 123h.
Preparing data input
Data setting at DT0 to DT1
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter FFFFFF00 in addresses 104h and 105h.
Comparison coincidence
Comparison coincidence signal detection on rising edge.
Reverse signal
Turn on the reverse signal at inverter.


R9010
[F61 DCMP, DT0, DT4]
32-bit data comparison
Compare current value and deceleration point
R3
TO
R6
Y50
TMX0, K20
0.1s Timer
Set K20 and use it as 2s timer
T0
[F22 +, I0, K2, I0]
16-bit added
Add K2 to 10 and change target value.
[F60 CMP, I0, K9]
16-bit data comparison
Compare values in 10 and K9
T0
R900C
R1
Decide if values in 10 < K9
(MCE 0)
Emergency circuit breaker
X42
[F1 DMV, HFFFFFFFF, DT96]
Preparing data input
Data setting in DT96 to DT97
[F151 WRT, K0, DT96, K2, H104]
Shared memory input
Enter FFFFFFFF into addresses 104h and 105h.
Assign HSC unit in slot No.0
Input 2 words of data from register DT96 to DT97
into HSC shared memory 104h to 105h.

Stored value in data register

Address	Event
DT0, DT1	Current value
DT2, DT3	Current target value
DT4, DT5	Deceleration point (Absolute value)
DT10, DT11	Deceleration point (Absolute value)
DT12, DT13	Target value 1
DT14, DT15	Target value 2
DT16, DT17	Target value 3
DT18, DT19	Target value 4
DT20, DT21	Target value 5

NX70/NX700 Series High-Speed Counter Modules (4CH) (NX70-HSC4 and NX-HSC4) User Manual

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